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PREFACE

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This index, though arranged alphabetically, retains the grouping of the subjects used in the *Monthly Bulletin*. The arrangement of the subjects in each group is in chronological order of publication, except in the case of those relating to Agricultural Development, where the alphabetical arrangement was considered more useful.

Except in the case of the original articles, which are numbered according to their pages, the numbers of each subject refer to the paragraphs in the *Monthly Bulletin*.

The index consists of three parts: one, of the original articles, one concerned only with Agricultural Intelligence and the last with Plant Diseases.

This volume of contents has been prepared by the redacteurs Dr. Giulio Provenzal and Prof. Giulio Trinchieri.

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART

ORIGINAL ARTICLES

Reconstitution of Portuguese Vineyards by means of American Stocks.

by

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The cultivation of the vine is still one of the most important and characteristic branches of agriculture in Portugal. Vines are cultivated in every part of the country from the dunes of the coast up to 1 600 ft. above sea level. They occupy an area of about 773 000 acres, and, either gathered in great numbers in contiguous belts or scattered among other crops, they extend over a great part of the whole Portuguese slope which gradually sinks in a south-easterly direction from a height of 6 500 ft. down to the level of the Atlantic. The Portuguese vineyards produce upwards of 154 000 000 gallons of wine, among which are some of the most famous wines of the world: Port, Madeira (1), Muscat of Setubal and *Corcavelles,* besides some excellent table wines such as *Collares, Bucellos* and Daô, and great quantities of wines for blending purposes. The yearly produce of the Portuguese vineyards is worth upwards of 20 000 000 escudos (about £ 4 000 000); it pays 30 000 000 days' work to the vineyard hands and provides the export trade with nearly 22 000 000 gallons of wines of all qualities worth about 8 000 000 escudos (about £1 600 000). This great national asset, now the same that it was before the invasion of phylloxera, has been reconstituted in the period of about 15 years of systematic and effective fighting against the pest, not including the period of the first feeble and hesitating efforts at the commencement of the invasion.

Phylloxera was introduced into Portugal about 1872 by some French stocks planted in a vineyard of *Douro,* the district which produces Port wine.

At first the invasion was slight and not alarming. The surface of the region being very broken and not having much intercourse with the other wine-growing districts, the pest remained for a fairly long time limited to the Douro region.

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(1) In the Island of Madeira. (Author's note).

Owing to the indifference with which the vine growers considered the new disease, the State agricultural officials encountered serious difficulties in their first attempts to control it. Up to 1886 the struggle against phylloxera was inefficient and desultory; in some districts the farmers would not believe in a possible destruction of their vineyards and by their incredulity favoured the spread of the pest, carelessly importing infected cuttings and plants and allowing them to circulate freely in the country.

The means of control employed in Portugal were the same as those used everywhere else. Sulphide of carbon was used at first in all treatments, both curative and destructive. On a lesser scale potassium sulpho-carbonate was also used. Several farmers had recourse to flooding, but this process was applied to a limited area, barely reaching 5 000 acres.

To a greater extent planting in sandy soils was practised, and there are still some important vineyards on the sands of the coast and of the interior. The most extensive vineyard of Portugal and of the whole world, belonging to the great agriculturist José Maria des Santos is, for the greatest part of its considerable area — 11 115 acres — situated on sandy soils, and consists of ungrafted vines. This vineyard, which extends along a railway, affords a good demonstration of the efficaciousness of planting on sandy soils. The breaking up of the land before planting the vines, which was done by steam, caused a clayey subsoil to crop up in places near the middle of the vineyard. The first plantation having consisted entirely of ungrafted stocks, the vines planted on the clayey spots died of phylloxera in a short time, thus affording all those who travelled by that railway a convincing demonstration of the resistance to phylloxera of sandy soils, on which the great extent of the green foliage of the vines was barely spotted by the dead vines of the clay patches. This spectacle, however, did not last long because the vines on the clay spots were replaced by American stocks. The land, but slightly undulated, is constituted by very mobile tertiary lands, sometimes quick sands, resting on a clay subsoil over which there is a film of water, which, as is well known, still further increases the resistance of sand against the spreading of phylloxera.

Nevertheless the greatest aids to the reconstitution of the Portuguese vineyards were the American stocks upon which they are almost exclusively based.

In fact if the above mentioned plantations be excepted, namely those *ungrafted* ones that are protected by *flooding* or by their situation on *sandy* soils, it is difficult to find vineyards that are not completely infested by phylloxera in Algarve, the most southern province of the country, from the rest of which it is separated by a mountain range averaging about 2 000 ft. in height, and in the most northern province, Minho, where the vines being trained high resist longer, as is well known, the destructive action of the insect. All this however does not make up an area much above 197 000 acres actually under vines.

The first attempts at reconstituting with American stocks were not successful.

In 1880, M. Laliman, who played an important part in the reconstitution of the French vineyards, delivered a lecture at the Central Society of Agriculture of Portugal and found his audience incredulous and hostile to American stocks.

The want of success which attended the first attempts with American stocks is explained by the scanty knowledge the experimenters possessed of these vines, of the conditions required for their *adaptation* to the various soils, and of their affinity to the varieties of the country. To these reasons must be added the careless use of non-selected stocks and the want of skill in grafting.

The non-selected *Jacquez*, York Madeira, Herbemont, Taylor, and Solonis vines caused the failure of several plantations.

It was only later, towards 1888, when some reconstitutions on a grand scale had succeeded, that the reconstitution movement began to develop.

Already in 1895 the fears of a probable excess of production caused a congress of vine growers to be held at Lisbon! When confidence was reestablished, Portuguese vine-growers, by their initiative, diligence and outlay of capital, gave a great example of energy and of their capacity to act intelligently and rapidly.

With the exception of some errors of *adaptation* and the want of scruples of some nurserymen, it may be said that the reconstitution was perfect and its results excellent.

The present Portuguese vineyards are grafted on the American stocks Riparia and Rupestris and on some hybrids of Aramon Rupestris (Ganzin), Riparia × Rupestris No. 3306 and 3309 (Coudère) and No. 101-14 of Millardet.

By far the greater number of Portuguese vineyards include almost exclusively the pure species Riparia and Rupestris in their various forms; Riparias are especially represented by *Riparia gloire de Montpellier* in loamy soils, and the Rupestris by *Rupestris monticola* in heavy clay soils, and by *Rupestris Martin* on the stony and dry hillsides. Some vineyards in moist soils are grafted on Solonis and Solonis × Riparia. Nevertheless the results yielded by Solonis were very uncertain, according to the *forms* employed, and some plantations of Solonis in full vegetation were to be seen by the side of others showing but little vigour, while others again were already dead, according to the greater or lesser honesty of the nurserymen.

The reconstitution on calcareous soils is not a problem of very great importance in Portugal, as soils containing much lime or rich in limestone in a state of minute division occupy a very limited area. Soils with more than 10 per cent of limestone are rare.

Nevertheless on some of these soils Berlandieri and its hybrids with *Vinifera* have been employed. More frequently though, Aramon × Rupestris No. 1 of *Ganzin* and Rupestris Monticola, which possess sufficient resistance for most cases, are to be met with.

American vines as direct producers of grapes have been tried, but only as curiosities. In the Azores some Isabella vines, a variety of Labrusca whose grapes have a foxy taste, are still kept. On the mainland this kind is considered only as ornamental.

The adoption of American vines modified profoundly the cultivation of the vine in Portugal.

The first effect has been to change the situation of the vineyards, which formerly were located on the hill slopes in dry and poor soils. Now the vineyards have descended to the plains or kept to the slightly sloping ground where the soil is deep.

Some of the most fertile plains of the country, like that of Ribatejo, have been planted to vines on a great scale. Besides the greater needs of American vines as regards depth of soil and the depth to which the latter has to be broken up, the change in economical conditions has avoured this displacement of the Portuguese vineyards, which at first lost something in the quality of their produce but gained much in intensity of production.

Grafting, which was rendered necessary by the use of American stocks, contributed also to the increase of production, and by requiring greater care to be taken in the cultivation of the vine brought about a great improvement in cultural methods. The graft most used was cleft-grafting and frequently also whip-grafting in plantations made with American cuttings; inarching was used only in nurseries.

From the preliminary breaking up of the soil up to the vintage it may be said that all operations connected with the vines have been influenced by the introduction of American stocks. The soil was worked to a greater depth and more thoroughly. Preparatory and cultural improvements, which formerly were compratively rare, became common practices. The use of artificial fertilizers, nitrogenous, phosphatic and even potassic, notwithstanding the fact that Portuguese soils are frequently rich in potash, became general.

The vines were planted further apart, and instead of being placed always in rows or squares, they were planted to a great extent in quincunxes. The average distance between the vines, formerly 3 ft. 3 in. to 4 ft. 9 in., has often been increased to 6 ft. 6 in.

Hoeing has became a current practice.

The system of pruning the canes known as Guyot's, though it is of Portuguese origin and has been practised from remote periods in the Douro region, has become general throughout the country; the old system of pruning is still followed in the great vineyards of Ribatejo and in the plains, with the only object of saving expense.

As for the vintage, more care than formerly is bestowed on fixing the time of gathering the grapes, on their selection and transport. Even in wine-making an improvement has taken place since the appearance of phylloxera.

In conclusion, it may be said that if the invasion of phylloxera has been a calamity, all the sacrifices which it has entailed have been compensated by the improvement and intensity of the present production and by its increased value.

Neither vine-growing nor wine-making in Portugal has anything to fear from comparisons with the same industries in any other country.

Portuguese viticulture as it is at present reconstituted, is still expanding, and bears witness, by the excellent results it has achieved, to the value of American stocks and of the modern technical processes of vine-growing and of wine-making.

The Recent Development of Cattle Breeding in Germany.

BY

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Owing to the expansion of trade throughout the world and to the development of flourishing industries, German agriculture underwent far-reaching changes during the second half of the last century. While the prices of grain have at times fallen considerably and are now again moderately rising, the prices of animal products have uninterruptedly followed an ascending course. A population continually growing in numbers and in prosperity was inclined and able to increase to a great extent its consumption of animal products. It was thus that German farmers found in the rearing of live stock at least a partial compensation for the loss of their prospective profits on grain-growing.

Of course the single branches of live stock keeping were each of them differently affected by the altered economic conditions. The breeding of sheep, which had been carried on chiefly for the production of wool, was struck hard by the cheap colonial wool that invaded European markets, and the gradually increasing prices of meat were not sufficient to make good the deficiency. It is true that a gradual change in the breeds of sheep kept had begun; namely from those producing only wool to those yielding wool and meat and even only the latter; still the number of sheep in Germany has fallen to a quarter of what it was in the sixties of last century, and, notwithstanding the better prices for wool, this movement has not yet ceased. On the other hand, notwithstanding the notable extension of railways and the recent diffusion of the motor-car industry, the number of horses has increased at a fairly uniform rate. From 3.19 millions in the early sixties the number has risen to 4.35 millions in 1907, that is in the ratio of 100 to 136. The number of goats has also considerably increased, having risen in the same period from 1.82 millions to 3.53 millions, or as 100 to 194, and still greater is the increase in the number of pigs, which in 1861 was 6.46 millions and in 1907, 22.15 millions, that is in the ratio of 100 to 343.

The development of cattle breeding was not so striking. The much greater weight of the animals and their consequently greater food requirements, their slower growth and the longer life of the individual animals, which is not determined, as with pigs, only by the production of flesh, but extends over years for the production of milk and of muscular energy, rendered a rapid increase in the number of head impossible. Nevertheless the figures show considerable progress. The census for the whole German empire give the following returns :

	Head of Cattle	
1861	14 999 194	
1873	15 776 702	+ 5.2 per cent.
1883	15 786 764	+ 0.1 „
1892	17 555 834	+ 11.2 „
1900	18 939 692	+ 7.9 „
1907	20 630 544	+ 8.9 „

At first, during the above period the increase was not much, but after the eighties it grew considerably. The returns of the census taken at long intervals of time for the whole of the German Empire show the increase in the number of cattle even during recent years to have been fairly uniform. In reality, however, such was not the case, for the development was irregular, as is proved by the yearly enumerations made since 1907 in the largest cities of the German Federation and in the Kingdom of Prussia.

In Prussia the head of cattle were :

In	1900	10 876 972	
	1902	10 405 769	— 4.33 per cent
	1904	11 156 133	+ 7.21 „
	1906	11 646 908	+ 4.40 „
	1907	12 011 584	+ 3.13 „
	1908	12 089 072	+ 0.65 „
	1909	11 763 161	— 2.70 „
	1910	11 592 521	— 1.45 „
	1911	11 662 234	+ 0.77 „

In the years 1902, 1909 and 1910 the number of cattle diminished. This was due to scanty forage crops and partly also to diseases. It is remarkable however that in 1911, during which year both the above mentioned adverse conditions obtained, a slight increase took place. This is the best proof that endeavours are being made in every way to increase the stock of cattle.

On each square mile of total area there were in 1873, 75.9 head of cattle, in 1892, 84.5 and in 1907, 99.1. With the increase of the population of the German Empire the number of animals has not quite kept pace. To every 100 inhabitants there were in 1873, 38.4 head of cattle, in 1892, 36.5 and in 1907, 33.0. It would however be erroneous to conclude that the present stock of cattle yielded less per inhabitant than it did in the seventies of last century. During this period not only have cattle grown in number but also, owing to better feeding and better breeding, they have much improved in precocity, live and dead weight, in milk yield and consequently also in value. In regard to live weight and value, valuations were made in connection with the returns for 1883, 1892 and 1900, according to which the live weight increased between 1883 and 1900 from 100 to 132 and the value from 100 to 136, whilst the number of head increased only from 100 to 120. In other words, one average head of all age-classes weighed in 1883, 706.2 lb. and in 1900, 774.4 lb., which amounts to an increase of 10 per cent. in the live weight, and about the same in the yield. There is no doubt that the dead weight has increased in a higher degree. The greater precocity which leads to a younger stock and to a quicker sale of fattened cattle may be so far translated into figures as the proportion of cattle of the younger age-classes constitutes now a greater proportion of the total stock than formerly. It means a more rapid sale and this of animals possessing a higher dead weight. It has been calculated that in the last thirty years the production of beef and of veal has increased by 60 per cent. The greater number of cows, and further the improved milk yield of the individual cows, has also led to a higher production of milk. Though the assumption that the amount of milk produced in Germany has doubled since the seventies may be disputed, there can be no doubt that *the increase in the quantity of food stuffs produced by cattle rearing has sensibly outstripped the rise in the numbers of the population.*

As regards the distribution of the stock of cattle according to the acreage of the farms, and the changes that have taken place in this respect during the last 25 years, the following table showing the figures for the Kingdom of Prussia, gives a fair idea.

Farm	Acreage	Percentage		On 100 acres of cultivated area the number of head of cattle was in:		
		of cultivated area	of stock of cattle	1882	1907	1882=100
Cottagers	up to 5 acres	1.71	6.63	30.7	41.2	134.2
Small peasants' farms	5 to 12 ½	6.34	13.06	25.5	27.5	107.9
Medium » »	12 ½ to 50	27.66	33.96	16.2	21.0	126.8
Large » »	50 to 250	32.90	29.69	12.1	15.8	130.0
Large estates	250 and upwards	31.39	16.66	5.6	9.7	171.4

For the whole German Empire the conditions are very nearly the same; of the whole stock of cattle, 6.6 per cent. is held by cottagers, while peasant farmers with farms ranging from 5 to 250 acres possess 81.8 per cent. and the large estates only 11.6 per cent., or much less than in Prussia. In proportion to the acreage the number of cattle diminishes with the extent of the farm. In this respect it is to be observed that the increase of cattle in large estates has quite recently become considerable. This is due in the first place to the tendency to fill up the gap caused by the cessation or limitation of sheep rearing.

With the object of raising cattle breeding to its present level and to further it still more, great efforts have been made both by public bodies and by private persons. The activity of the Imperial Government is principally directed, besides to political and economical measures, to the control of plagues and diseases, in which a suitable protection of the frontiers is no mean part. The immediate measures for promoting cattle breeding are left to the individual States and to the special representative bodies. For the whole of Germany the figures are lacking, but Prussia has set apart, in the year 1910, a sum of a million marks, in round numbers (about £50 000), for the benefit of cattle breeding alone. Some of the other States of the Federation have in proportion to their area allotted still higher sums. On the means employed the following information will be of interest.

The choosing of bulls for breeding purposes by officials has been introduced with but few exceptions into the whole of Germany. For providing bulls for breeding purposes the South German States have followed the example of Baden and possess communal bull stations (*Gemeindestierhaltungen*) which, especially for small holdings, have been most beneficial. In North Germany there are the bull stations (*Bullenstationen*), which by means of the Chambers of Agriculture provide good bulls from funds loaned by the State without interest. These stations may be considered as the forerunners of the breeding associations, also inasmuch as they prepare the way for a certain unity in the trend of breeding. For the supply of male animals for breeding purposes there exist in several localities rearing stations, breeding-cattle farms and pedigree herds, which in part prepare bulls by suitably rearing young males bought for the purpose and in part they breed them themselves. Pedigree females are also sometimes bred, but not so frequently.

Recently a far-reaching influence in promoting breeding has been exerted by the breeding societies or breeding cooperative associations, often called herdbook associations. They depend upon private initiative and extend over areas of very different extent, in some cases over a whole province, in others over only a district. Often several small cooperative associations are united into a federation. The breeding associations deal only with the improvement of one breed, for which purity of breed is always the object aimed at, notwithstanding that sometimes recourse is had to crossing. One of the most essential tasks of the breeding associations is the collection of pedigrees, which are entered in the herdbook and published. On principle every animal, male or female, must be approved by specially appointed officials before being entered.

Recent researches have shown, in all branches of breeding, that there are always some few animals that stamp their characters upon a breed in which their blood flows. The use of the best blood, with a definite object in view, holds out to the breeding industry the most promising prospect, and will greatly facilitate bringing about uniformity in the animals of the various races. The activity of the breeding associations extends to every measure that tends to improve breeding. Thus, bull stations are established;

the use of valuable breeding animals is ensured for a length of time by means of maintenance prizes; exhibitions and distribution of prizes are held; performance records are kept; pastures for young animals are prepared; plagues and diseases are controlled; the sale of breeding animals is organized by means of markets and auctions. One or more of these measures is adopted according to local conditions. The breeding associations have attained at present a highly flourishing condition under the influence of the German Agricultural Society (*Deutsche Landwirtschafts Gesellschaft*) which supervises their activity and "recognizes" them when they satisfy certain conditions, thus entitling them to exhibit at the great shows held every year in another place. In 1911 there were in Germany, for cattle alone, 1051 breeding associations. Under their influence systematic breeding of certain races has arisen; in several parts of Germany its further development has been much assisted by the inspectors of breeding who have been charged with the professional oversight of the work.

Every year numbers of shows are held and prizes given, both local and district shows as well as provincial and national. The most important is the great German exhibition of the *Deutsche Landwirtschafts Gesellschaft*, which is held every year in turn in the various provinces, and which has powerfully stimulated all branches of German agriculture, including cattle breeding. Most of the shows are reserved to animals kept for breeding purposes; occasionally fat cattle shows are also held.

Besides the above mentioned aids to breeding, there are also the performance records, which, especially for milk, have been established chiefly in the North of Germany on the lines of the Danish control associations. Their number to-day is about 500. They record, with the assistance of a special employé (control assistant), the yield of milk according to quantity and to fat content and ascertain at the same time the consumption of food for each cow. They have given a firmer basis to selection for breeding and have improved the feeding. The best cows have been recognized and their offspring, both male and female, has been reared. Further the proper use of concentrated foods according to the milk yield has been learned. Thanks to these control associations, the keeping of cattle has become more profitable.

From the above it will be seen that in Germany much importance is attached to the improvement of cattle breeding, for the attainment of which object ample means are provided and great efforts are made. Much still doubtless remains to be done, but it cannot be denied that a wholesome progress has been achieved and great hopes may be entertained for the future.

Measures adopted in Switzerland for the Introduction of Agricultural Book-keeping into the Peasants' Farms.

by

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During the last fifty years agriculture has made enormous progress. It has not only developed its technique in a high degree, but it has also adapted itself to the new economical conditions. While for many years farming measured its production only by the standards of its own wants, it has been forced by the general evolution of the world to wake up from its apathy, to introduce radical modifications in its systems and thenceforward to dispose of its produce on the great markets. It is thus that in a certain sense farming has come to resemble commercial and industrial enterprises. But whilst in these the principles of book-keeping have been adopted as the basis of their activity, and carelessly kept accounts are considered as a proof of a want of sense, and may in some cases fall under the rigours of the law, the great majority of farmers, even to this day, think that they can farm profitably without availing themselves of the guidance afforded by book-keeping.

This opinion is decidedly harmful to farming. Not only does it cause losses by the absence of the means of control, or by the introduction of measures that do not answer to the objects aimed at, but it is responsible on the one hand for the exaggerated prices paid for land and farms, and on the other for the low prices taken for the produce, which often do not cover the cost of production.

It is not rare to find that farmers do not know the rate of interest that the capital engaged in their farm is bearing; moreover, through lack of book-keeping, they are not in a position to say what prices their produce should command so as to cover the cost of production.

In order to remedy this state of things, far-sighted men have for a long time past been endeavouring to popularise the principles of book-keeping among the farming classes, but without however having succeeded in introducing them into general practice. It is therefore a matter for rejoicing that in Switzerland a number of peasant farmers have been gained over to the idea and now keep their accounts under the control of a central Bureau.

The work done in this connection by the Swiss Peasants' Secretariat has attracted the attention of numerous agricultural circles, and other countries have been stimulated to convert their farmers to these ideas. In Germany, especially, where the introduction of the income tax has caused the want of properly kept accounts to be keenly felt, the endeavours made with the object of introducing book-keeping into the practice of farming have been greatly facilitated.

In Switzerland the success which has attended the researches on the profitableness of farming is mainly due to the adoption of the following principles:

1. Selection of a system of book-keeping which spares the farmer unnecessary writing, but which enables him to balance his accounts correctly.
2. Uniform instruction for the accountants, who must engage themselves by an agreement to keep their books.
3. The balancing of the books to be done by a Central Office.
4. Comparative examination of the figures and use of the results in the study of questions connected with political economy and with the science of farming.

We shall endeavour to give a brief account of the way in which these researches have been organized in Switzerland.

1. *The system of book-keeping*: The various systems of book-keeping used by farmers may be divided into two distinct groups, on the one hand those which only determine the net returns *of the property as a whole*, on the other those which determine the profitableness of each of the different branches of the farm. The former of these methods is the one that has been adopted in Switzerland. It does not entail upon the farmer the work of following the exchange of values in the interior of the farm. It simply sets forth what the farm disposes of to third parties and what it gets from them, and shows at the end of the year in what manner the amount of its capital has changed from what it was at the beginning of the same period. Nevertheless, under the term "third parties" the farmer and his family are included, in connection both with eventual accessory undertakings and with consumption. As this latter is often connected with that of the salaried hands, the common household is also considered as a third party. This system of book-keeping is therefore based on four accounts: *Farm, Household, Accessory Undertakings, Consumption.* The household account only plays the part of intermediary, and the expenses which it bears at the end of the year are distributed among the other three accounts in proportion to the number of persons maintained.

These four accounts must embrace the totality of the components of the farmers' capital, as well as all the income and outlay of money. The exchange in kind taking place between these accounts must also be determined, but not particularly within each account. In order to attain this object the farmer must draw up an *inventory* at the begining and end of each year and must also keep a *cash account* and enter in a *housekeeping book* the exchange in kind between the several accounts. A personal account current will complete this system of book-keeping, which allows the gross returns and expenses, the net income, the value of the farmer's labour, the interest his capital has produced, his household expenses and consumption, and the changes that his capital has undergone, to be known.

2. *Organization of the investigations.* In order to induce farmers to take part in them, the courses of book-keeping are announced by the agricultural press and by some of the political papers. The candidates are not admitted to the course unless they engage themselves *by agreement* to keep the accounts of their farm for at least one year, and to submit their books to be audited by the Secretariat, which examines them also as to the profitableness of the farm. The candidates then take part in a three days' course for which all their travelling and living expenses are reimbursed and the necessary material, such as forms, etc., supplied free of charge. Besides this, when they give up their accounts they get an artistically designed diploma and a prize of 30 francs (about 24 shillings). Those farmers who, after having taken part in the course fail to keep their engagement, have to reimburse the Secretariat all expenses incurred on their behalf. It is to a great extent due to these measures that the majority of accountants submit their books to the Secretariat. With the object of encouraging farmers to continue keeping their books in the following years, the Secretariat supplies them with the requisite material and undertakes to balance their accounts for them. Those who for ten years have submitted their accounts to the control of the Secretariat are rewarded with a wine-cup with an inscription engraved on its silver mounting, and their names are published. During the course of the first year each book-keeper is visited by an employé of the Secretariat who checks the books, especially the inventory, draws up, on a uniform plan, a brief description of the farm, discusses and settles all questions likely to present difficulties, such as deciding on the amount of retribution to be assigned to the farmer and to his family, or distributing the rent of the buildings, etc. The expenses of these researches, including the work done by the Secretariat, amount on average to 100 frs. (about £4) per annum per farm.

3. *Closing the accounts.* — The accurate closing of the accounts of a farm is a more complicated affair than the same operation in a commercial business. The causes of this are, besides the difficulties encountered in questions concerning valuations, the intimate connection existing between production and consumption. The consequence is that if the use of book-keeping is to spread among peasant farmers, it can only be possible on condition that the closing of accounts be entrusted to a Central Office and not to the farmers themselves. This principle has been adopted in Switzerland, and the Peasants' Secretariat closes all the accounts. Two methods are followed: one, the *simple closing*, shows only the net returns and the income of the farms and of the accessory enterprises; the other, the *amplified closing of accounts*, also examines separately the various items of the gross revenue and of the expenses, without however doing the same for the net returns. The farmer receives only the simple closing of accounts. The two methods are a control on each other.

4. *Examination of results.* — The results of these books are submitted to methodical examination. The researches bear on the amounts of capital employed, on the outlay for labour and the other working expenses, as well as on the gross and net returns and on the income; the consumption is also examined. By means of these investigations knowledge is gained as to the influence which the extent of the farms, the manner of utilizing the soil and the kind of farming have upon the produce destined for the market, upon the intensity of the farm, etc. The figures obtained every year form the matter for new groups and thus the changes happening in the course of several years may be followed and observed.

Some of the principal results are given here below:

Years	Number of accounts closed	Expenses per acre	Gross revenue per acre	Net returns		Interest on capital per cent.	Remuneration of labour per work-day and per head	Farming income (interest and remuneration of labour) per work day and per head	Household expenses per day and per head
				per acre	per cent.				
		£ s. d.	£ s. d.	£ s. d.			s. d.	s. d.	s. d.
1901	110	6-10- 4.5	8- 0- 7.3	1-10- 3.2	1.94	0.82	11.3	2- 3.8	11.5
1902	58	6-14- 8.6	8-19- 2.4	2- 4- 5.8	3.28	2.86	—	3- 1.1	—
1903	137	7-13- 9.5	10- 5- 8.4	2-11-10.8	3.63	3.29	1-11.1	3- 3.0	11.9
1904	175	6-17- 9.5	9- 7- 3.0	2- 9- 5.0	3.21	2.57	1- 5.1	2-10.1	11.9
1905	204	7-12- 3.2	10- 2- 0.7	2- 9- 9.5	3.27	2.90	1- 7.1	3- 1.6	1- 0.4
1906	230	7- 8- 1.6	10- 7- 0.5	2-18-10.9	3.75	3.77	2- 0.8	3- 3.1	1- 0.8
1907	250	7- 4- 7.7	10-10- 4.2	3- 5- 8.5	4.02	4.22	2- 1.1	3- 4.5	1- 1.1
1908	287	7-18- 0.2	11- 0- 7.9	3- 2- 7.6	3.78	4.45	2- 4.8	3- 7.2	1- 1.6
1909	276	8-10- 6.8	11- 6-10.8	2-16- 4.0	3.31	3.01	2- 2.6	3- 5.4	1- 1.9
1910	270	8-15- 6.4	11-16- 3.6	3- 0- 5.4	3.71	3.68	2- 8.8	3-11.1	1- 2.3
1911	283	9- 4-10.4	12- 5- 6.8	3- 0- 8.4	3.65	3.49	2- 9.7	3-11.1	1- 2.6
Average 1901–05	*684*	*7- 3- 8.8*	*9- 8-10.8*	*2- 5- 2.0*	*3.11*	*2.46*	*1- 6.1*	*2-11.2*	*11.9*
» 1906–11	*1596*	*8- 3- 7.4*	*11- 4- 5.5*	*3- 0-10.1*	*3.70*	*3.77*	*2- 4.8*	*3- 7.2*	*1- 1.7*
» 1901–11	*2280*	*7-16- 7.3*	*10-10- 4.1*	*2-13- 8.6*	*3.41*	*3.19*	*2- 0.5*	*3- 3.3*	*1- 1.0*

SECOND PART

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1 – Decree approving the Regulation of the Brazilian Government Stations of Sericulture.

Actos do poder executivo. Decreto N. 9671 de 17 Julho 1912. — *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year I, No. 3, pp. 11-16. Rio de Janeiro, 1912.

The Decree No. 9671, of July 17, 1912 approves the Regnlations of the Sericulture Stations created in conformity with Law No. 2544 of January 4, 1912, and enacts that the object of the Sericulture Stations is to study experimentally all the factors of the production of silk, so as to be in a position to provide farmers with precise data for the improvement of the methods of silkworm rearing.

The Stations are charged with the following duties :

1. — The study of all the conditions that are essential to the success of silkworm rearing.

2. — The study of the causes of epidemics and of the most efficient means of control.

3. — Carrying out experimental silkworm rearing with the object of producing silkworm eggs to be used in their turn for the prodution of other eggs.

4. — The production, selection, preparation and distribution to farmers of good silkworm eggs.

5. — The gratuitous microscopical examination of silkworm eggs, larvae, chrysalides, etc., at the request of persons interested in silkworms.

6. — The cultivation, and distribution to farmers, of varieties of mulberries adapted to the various localities.

7. — Testing new species of silk cocoons and new apparatus for rearing.

8. — Answering questions connected with sericulture.

9. — Practical study of the industrial utilization of the products of sericulture.

10. — Spreading by means of books and lectures, the improved methods of sericulture.

11. — Surveillance of the process of silk rearing and advising as to the best means of improving it.

12. — Promoting the institution of silk factories.

13. — Spreading practical instruction in silk spinning and weaving.

The stations of sericulture shall not limit their activity to the study of the silkworm, but shall extend it also to silk, its preparation, properties and various uses. They are to be provided with buildings, laboratories, workshops, and cold storage chambers, in which to rear silkworms and impart practical instruction, and further with an experimental mulberry plantation to supply the necessary food for the worms. Two practical courses shall be held every year, one, lasting three months, for men, and one of one month for women.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

2 - The Position and Condition of the Prussian Rural Continuation Schools during the Financial Year 1911.

Stand und Verhältnisse der preussischen ländlichen Fortbildungs-schulen im Rechnungs Jahre 1911. — *Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen* (1), Part I, 1912-13, pp. 1-19. Berlin, October 1912.

In the year 1911, there were in the Kingdom of Prussia 5349 Rural Continuation Schools. Of these, 230 were established by districts (Kreise), 3904 by parishes (Gemeinde), 43 by Agricultural Associations, and 1172 by private individuals and other agencies. The expenses of the schools were defrayed : in the case of 15 by the districts alone, in that of 21 by the parishes alone, while one was supported by Agricultural Associations, 1187 solely by means of State contributions, 3973 by the State in conjunction with other interested parties, and 149 by private individuals and other agencies. The number of self-supporting schools was 3. The expenses, excluding upkeep, heating, lighting and cleaning of the school-buildings, amounted to £42 454. This expenditure was met by : £1855 derived from fees, while private individuals and institutions furnished £1432, Agricultural Associations £112, districts £4594, parishes £5438, Provinces £308 and the State £28715. The number of pupils was 86 689 and that of the teachers 7554; of which 354 were ministers of religion, 4 agricultural teachers, 7135 teachers in the elementary schools and 61 other persons. Instruction was given only during the winter in 5298 schools, and only 51 were open throughout the year. There were in 1911 761 more schools than in 1910.

Since 1896, the number of Rural Continuation Schools has increased : from to 570 in the Province of East Prussia, in that of West Prussia from 9 to 206 ; in the Province of Brandenburg from 1 to 310 ; in Pomerania from 3 to 233 ; in Posen from 22 to 566 ; in Silesia from 29 to 715 ; in Saxony from 43 to 211 ; in Schleswig-Holstein from 50 to 224 ; in Hanover from 138 to 711 ; in Westphalia from 15 to 280 ; in Hesse-Nassau from 325 to 874 ; in the Rhine Province from 244 to 293; in the Hohenzollern province from 51 to 56; in the whole State of Prussia from 930 to 5349. The total number of scholars rose in the same time from 13 307 to 86 689; the average number of students per school rose from 14.3 in 1896 to 16.2 in 1911. In the Provinces of Silesia, Hanover and Hesse-Nassau most of the school-attendance was compulsory, which accounts for the extraordinary increase in the scholars in those districts.

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(1) Rural Continuation Schools are schools in which, chiefly in the winter months, instruction is given to the country youths (13-20 years of age) according to a fixed curriculum similar to that in force in the primary schools, special attention being given to agricultural subjects.

3 – Standardization of Instruction in Forestry in the United-States.

Report of the Committee of the Conference of Forest Schools. — *Forestry Quarterly*, Vol. X, No. 3, pp. 341-394. Ithaca, N. Y, 1912.

Within the last decade the number of forest schools in the United States has increased with remarkable rapidity. To-day there are 24 institutions which give courses leading to a degree in forestry, and about 40 others which include forestry in their curriculum. Over 500 young men are preparing themselves in these schools for forestry as a profession.

Within the last few years, it has been felt more and more that with the large number of forest schools there is a danger of lowering standards, and that it is desirable to attempt a standardization of forestry education.

The first step towards such standardization was brought about in December 1909, on the initiative of Gifford Pinchot, who called a conference of forest schools to consider the aim, scope, grade and length of curriculum. At this conference a committee was appointed to draw up a plan for the standardization of the requirements for technical training in forestry. There were appointed on this committee Henry S. Graves (chairman), B. E. Fernow, R. T. Fisher, Gifford Pinchot and Filibert Roth. The committee formulated provisionally a standard for forestry education, and called a second conference of forest schools in December 1911, in Washington, to consider its report.

The following institutions were represented at this conference: Yale University, Harvard University, University of Minnesota, Michigan Agricultural College, Massachusetts Agricultural College, New Hampshire College, University of Maine, University of Missouri, Iowa State University, University of Nebraska, University of Washington, Ohio State University, Syracuse University, Pennsylvania State College, Pennsylvania State Forest Academy, and University of Toronto, Canada.

The provisional plan of the committee was discussed in detail by the conference and an expression of opinion by majority vote obtained as to requirements for admission, the courses to be given in the curriculum, and the number of hours for each course.

The need for at least four different grades of training has been recognized.

I. Advanced professional training to include not only a substantial general education but also a well rounded course in all branches of technical forestry.

II. Instruction for Forest Rangers, requiring merely a common school education and conducted mainly along thoroughly practical lines.

III. General instruction in forestry supplementary to a course in agriculture, and designed to assist owners in the handling of their own woodlands.

IV. General course in conservation and forestry designed for those who wish, as a part of their general education, to have some information on the economic problems involved.

The work of the Educational Conference held on December 28-29, 1911 was confined exclusively to formulating the requirements of the high grade professional course, and this report, therefore, deals exclusively with the standardization of a course for advanced professional training.

The Committee has recognized at the start that there is a constantly growing need for specialists in forest work of three distinct types, besides general practitioners namely:

1) Foresters who have specialized chiefly along the lines of either forest management, or forest planting, or forest valuation or similar technical problems; 2) forest engineers; and 3) forest technologists. To develop specialists along these three lines within four years of college work is an impossibility. Therefore the scope of the courses considered in this Report has in view a well-balanced professional school which does not aim at great specialization in any of these three lines of work, but attempts to give a general knowledge of the principles which underlie the entire field of the forester's activities, leaving the acquisition of specialized knowledge to be gained by the students after graduation.

The technical courses considered essential in a high grade school and the number of hours accepted by the Educational Conference as the minimum time to be devoted to each course are given in the following schedule:

Subject	Hours		
	Class Work	Field or Laboratory	Total
Dendrology, Forest Geography . . .	60	66	125
Silvics and Silviculture	100	250	350
Tree Diseases	20	30	50
Forest Entomology	20	30	50
Forest Protection	20	with management	20
Forest Mensuration	40	100	140
Forest Management: Finance - Regulation - Working Plans	70	150	220
Forest Utilization:			
Lumbering-Engineering	90	190	280
Forest Products:			
Timber Physics - Wood Technology .	50	100	150
Forestry History	20	—	20
Forestry Economics:			
Forest Policy - Forest Administration	95	—	95
	585	915	1 500

An attempt has been made in this report to describe at some length the scope of each course, outlining, at least for the most important courses in forestry, the fields which are to be covered in them.

But it is not the intention of the Committee to force the adoption of these exact outlines, since there is a full appreciation that on account of the personnel of the teaching staff and other practical considerations, there must be considerable latitude left to each school to arrange its course in such a way as to meet its special needs and use its particular facilities.

4 - Instruction in Cold Storage Methods in France in 1912-1913.

L'enseignement frigorifique en France en 1912-1913. — *La Revue Générale du Froid*, Year 4, Vol. IV, No. 11, pp. 607-609. Paris, November 1912.

In 1912-1913 the following courses of instruction in cold storage methods will be held in France.

1. — Course given by M M. Marchis and Maillard at the Higher School of Aeronautics and of Mechanical Construction of Paris. 2. — Evening course held by M. Blanchet at the Philotechnical Association of Paris. 3. — Course held at the Central School of Arts and Manufactures of Paris. 4. — M. Jules Henriet's course at the Marseilles Polytechnic Association.

The instruction in the first course is directed to satisfy the requirements of the examination for the diploma of Cold Storage Engineer given by the French Cold Storage Association.

For detailed programmes see the original publication.

5 - An Enquiry into the Condition of Association in Swiss Agriculture.

AGRICULTURAL INSTITUTIONS

Enquête sur l'état de l'Association dans l'Agriculture Suisse. — *Exposé du Secrétariat suisse des paysans*, No. 44, pp. 1-138. Berne, 1912.

The enquiry made by the Swiss Peasants' Secretariat for the purpose of determining the number of Agricultural Associations, Syndicates, Corporations, Societies and Leagues, together with their aims and the number of their members, extends to the whole of Switzerland.

According to this enquiry, the latter country possesses 6230 local associations. The number of the members has been ascertained in the case of 6065 of these (97.3 per cent.) and amounts to 293 719; on adding to this figure, the members of the 95 cantonal, intercantonal, and national organisations, the actual number of members belonging to the agricultural associations of Switzerland is 380 129. There are in Switzerland, in addition to the "Union suisse des paysans", 81 cantonal, intercantonal and national organisations formed by the Union of Associations; these possess a total of indirectly attached members amounting, according to this enquiry, to 346 225; on adding the 144 377 members of the Union suisse des paysans, a total of 870 731 persons affiliated to Agricultural organisations in Switzerland is obtained.

The following table has been drawn up for the purpose of classifying the different associations according to their aims:

Kind of Association	Number of Associations			Actual No. of Members
	Total	Having given list of their members		
		Number	Per cent.	
1. Agricultural Associations	856	841	98.3	266 876
2. Agricultural Cooperative Societies . .	567	561	99.0	105 728
3. Dairy Associations	2 819	2 766	98.1	140 471
4. Breeding Syndicates	1 293	1 268	98.1	78 904
5. Fruit-growing Associations	80	78	97.5	9 326
6. Vine growing Associations	57	55	96.5	4 986
7. Threshing Associations	133	129	96.9	3 946
8. Distilling Associations	53	51	96.2	974
9. Associations of Mills and Bakeries . .	42	41	97.2	6 447
10. Associations for Improvements, Draining and Irrigation	73	69	94.5	3 628
11. Associations of Alpine Economy . . .	233	183	78.5	11 167
12. Agricultural and Horticultural Associations	15	15	100.0	1 874
13. Associations of Agricultural Credit . .	145	145	100.0	18 636
14. Agricultural Insurance Associations .	41	39	95.1	73 391
15. " Union suisse des paysans "	1	1	100.0	144 377
Total . . .	6 408	6 242	97.4	870 731

Switzerland possesses, according to the census of Aug. 9,1905, a total of 243 710 farms of which the soil is cultivated; this gives a coefficient of representation for each farm of 3.56 for the associations with directly attached members, together with those composed of sections; and a coefficient of 1.55 for the associations possessing only directly attached members. Since many cases occur in which one person is a member of several associations, it is impossible to say exactly how many of the farmers belong to agricultural associations, and how many are not members of these bodies.

6 - Proceedings of the Sixteenth Annual Meeting of the American Association of Farmers' Institute Workers.

BEAL, W. H. and HAMILTON, JOHN: *U. S. Department of Agriculture: Office of Experiment Stations, Bulletin* 251, 75 pp. Washington, September 18, 1912.

At the sixteenth annual meeting of the American Association of Farmers' Institute Workers, the Committee on institute organization and methods presented a report in which some statistics are given which indicate the vastness of the farmers' institute work now being undertaken in America.

During the fiscal year ending in November 1911, there were held in the United States 16 741 sessions of regular farmers' institutes. These were made up of 3539 one-day meetings, 1942 two-day meetings, and 172 three or more day meetings, representing 7935 days of farmers' institute work. The attendance reported at all institutes was 2 412 600 persons. Attendance upon agricultural trains 995 220. The appropriation from all sources of support for the farmers' institutes was $ 445 193.

In many States three or more forms of instruction in agriculture and domestic economy are now being supplied the people outside the college walls, namely 1) the farmers' institute proper, 2) the operation of agricultural trains, 3) the conducting of demonstrations, 4) the holding of six-day schools or campaigns, 5) the organization of boys' and girls' clubs, 6) the establishment of the woman's auxiliary as a special feature of the institute work. The farmers' institute proper is but one phase of the general extension movement.

Fundamentally, the farmers' institute is not by nature a well-disciplined school consisting of teacher and taught. Instruction here assumes the form of positive statements, the declaration of established principles and the presentation of material facts of value to the producers of the country.

A successful farmers' institute must accomplish at least four things: 1) yield practical information to those having agricultural problems to solve; 2) more clearly define the farm problems of a community; 3) widen the circle of institute interest and influence; and 4) leave a permanent local organization, club, or institute that stands for agricultural progress.

Thirty-five States have recognized the importance of the farmers' institute work by providing specific appropriations for State support. The amount so appropriated for the past fiscal year aggregated $ 372 430.

7 - International Exhibition of Import and Export Products in Barcelona, Spain, from April 28 to July 2, 1913.

AGRICULTURAL SHOWS AND CONGRESSES

Daily Consular and Trade Reports, 15th Year, No. 232, pp. 32-33; No. 282, p. 1116. Washington, Oct. 2 and Nov. 30, 1912.

The exhibition will include, among others, the sections: Alimentation, Agriculture and Horticulture. Applications for space should be addressed to "La Exposición Internacional de Productos de Importación y Exportación, Barcelona". Branch offices of the exihition are also located at 148 Boulevard Voltaire, Paris, France, and 87, Rue des Foulons, Brussels, Belgium.

8 - International Colonial Exhibition at Samarang, Dutch East Indies, in 1914.

The Board of Trade Journal, Vol. LXXIX, No. 838, p. 605. London, December 19, 1912.

An International Colonial Exhibition will be held at Samarang in September, 1914. The exhibition will comprise sections for agriculture and horticulture (including machinery, etc., for cultivation and manufacture of sugar, coffee, etc.) ; the industries of the Dutch East Indies ; foreign industries (including machinery and appliances for *a*) supplying motive power, *b*) agricultural and forestry purposes, *c*) industrial purposes, *d*) general purposes, and *e*) household purposes) ; commerce, etc. Applications for space must be sent, not later than March, 1914, to the Secretary of the Exhibition, Samarang, or to the Office of the N. V. Nederlandsch-Indisch Publiciteits Bureau, N. Z. Voorburgwal 254, Amsterdam.

9 - Bristol Show, from 1st to 5th July, 1913.

Royal Agricultural Society of England. Annual Show at Bristol. Tuesday, July 1st, to Saturday, July 5th, 1913.

10 - Agricultural Exhibition at the Hague in 1913.

The Board of Trade Journal, Vol. LXXIX, No. 836, p. 494. London, December 5, 1912.

A National and International Agricultural Exhibition is proposed to be held at the Hague from the 3rd to the 15th September 1913. Entry forms and full particulars may be obtained from the Secretary of the Royal Netherlands Agricultural Society, 42, Buitendorf, The Hague.

11 - The Great Agricultural Week in Belgium in 1913.

La Grande Semaine agricole belge de 1913. — *Laiterie et Elevage,* Year 7, No. 22, p. 180. Louvain, November 30, 1912.

The Society of Agricultural Mechanics and of Agricultural Industries has just fixed the date of the 5th exhibition of agricultural machines, which will be held at the Palais du Cinquantenaire in Brussels from March 8 to 17, 1913.

As was the case last year, this exhibition will coincide with the Great Agricultural Week in Belgium.

Persons desirous of obtaining either the programme of the Exhibition of Agricultural Machinery, or the programme of the Great Agricultural Week, should apply to the Société de mécanique et d'industries agricoles, 20 Rue Neuve, Bruxelles.

12 - International Forestry Congress, Paris, June 16-20. 1913.

From the programme of the Congress communicated by the "Touring-Club de France," which is organizing the Congress, the following chief points may be reported.

1st. Section. — Forestry technique, or sylviculture : *Lengthening the coppice rotation and coppice-with-standards. Forest fire insurance. Forest protection.*

2nd. Section. — Forest economics and legislation: *Rating of woodlands.*

3rd. Section. — Forestry technology.

4th. Section. — Forestry work on a large scale: *Improvements of pastures. Recovery of mountains. Trees and water.*

5th. Section. — The forest in the development of touring and the aesthetic education of the people: 1) *Beauty of the country due to forests.* 2) *National parks.* 3) *Management of forests from the tourist point of view.* 4) *Sylvo-pastoral instruction.*

Art. 3 of the Regulations of the Congress provides that:

The Congress is to consist of French members and of foreigners; the subscription is fixed at 20 fr. and requests for admission are to be addressed to the President of the Organisation Committee, Headquarters of the Touring Club de France, Paris (65, Av. de la Grande Armée), naming the section which the member wishes especially to attend.

13 - Fourteenth International Poultry Exhibition in Paris in February 1913.

14e Exposition internationale d'Aviculture. - *Revue d'Aviculture technique et commerciale*, No. 40, p. 339. Paris, October 1912.

The "Société des aviculteurs français" announces that its Fourteenth International Exhibition of Poultry will be held on the first Friday in February 1913. This exhibition will also include a "fur and feather" section. Detailed information can be obtained from the Secretary of the Federation of French purveyors of eggs, fowls and game: Paris, 136 Rue de Rivoli.

CROPS AND CULTIVATION

14 - Investigations on "Sickness" in Soil, Soil Sterilisation, and Some Practical Applications.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1. RUSSELL, E. J. and GOLDING, J. Investigations on « Sickness » in Soil. I. Sewage Sickness. — *The Journal of Agricultural Science*, Vol. V, Part I, pp. 27-47. Cambridge, Oct., 1912.

2. RUSSELL, E. J. and PETHERBRIDGE, F. R. Id. II. « Sickness in Glasshouse Soils ». — *Ib.*, pp. 86-111 + plates II-V.

3. STONE, R. G. The present status of soil sterilization. — *Twenty-Fourth Annual Report of the Massachusetts Agricultural Experiment Station, Part I., Detailed Report of the Experiment Station*, pp. 121-125 + figs. 1-2. Boston, 1912.

4. LODGE, C. A. and SMITH, R. G. Influence of soil decoctions from sterilised and unsterilized soils upon bacterial growth. — *Ib.*, pp. 126-134.

5. See No. 45, *B.* Jan. 1912 and No. 485, *B.* March 1912.

6. Cf. *Lafar's Handbuch der Technischen Mykologie*, III. Band; V. BEHRENS, J., Mykologie des Dungens und des Bodens, § 116, pp. 447-450. Jena, 1904-1906.

7. Cf. LÖHNIS, F. *Handbuch der landwirtschaftlichen Bakteriologie*, V. C. Die Beeinflussung der Tätigkeit der Bodenorganismen, pp. 732-790. Berlin, 1910.

Russell, and Hutchinson have shown that micro-organisms of ordinary soils are not working at a maximum efficiency; that there exists a biological factor, provisionally identified with the soil protozoa, detrimental to bacteria and limiting their numbers and activities. It may therefore be found that causes not in themselves harmful to bacteria may bring about a reduction of bacteria through favouring the detrimental factor.

1. — Russell and Golding have studied the soil of a sewage farm, which about three years ago showed marked signs of « sewage sickness ». At this farm the sewage is simply screened and then applied to land that has been ploughed and is later to be cropped ; elsewhere it is applied direct to growing crops. So long as percolation is rapid the method works well, but « sewage sickness » sets in when percolation becomes too slow.

Examination of a sewage-sick field showed that the falling off in the rate of percolation was due to at least two causes. Wherever a pool of sewage had stood a green-black slime was found; the green material at and above the water-level was seen to contain living organisms. A second cause is the deflocculation of the clay by the free alkali of the sewage. Both these causes render the soil sticky and impermeable ; but they can be put out of action : the deflocculation by dressings of lime, and the accumulation of the slimy material by ploughing up the land into ridges and allowing it to dry.

There is however another factor. Analysis of the soil and laboratory partial sterilisation experiments have shown that a factor detrimental to bacteria can be traced in sewage-sick soils. This factor appears to be in every respect similar to that shown by Russell and Hutchinson in ordinary soils. It is put out of action by the same antiseptics (carbon disulphide and toluene) and by heat. It is not bacterial nor is it any bacterial product ; it is not carried by an aqueous extract of the soil. On the other hand it is transmitted to partially sterilised soils by inoculation with untreated soil ; it is not rendered inactive by aeration or by liming. Its effects are, however, much more pronounced in sewage-sick soil than in ordinary soil. While the bacteria in the untreated sick soil only rarely rise to 40 millions per gr., they may rise to 400 millions per gr. in the partially sterilised soils. The high amounts of moisture and organic matter in the sewage-sick soil appear to be especially favourable to the harmful factor.

Sewage sickness is thus regarded, in part, as an abnormal development of the harmful factor always present in ordinary soils. As in the case of ordinary soils, all the properties of the harmful factor indicate that it is biological and is due to in organisms larger than bacteria. Examination of the untreated soil showed the presence of amoebae and other protozoa, some of which could be separated in an active form by centrifuging; none were present in the partially sterilised soil. All the evidence available then points to these as constituting the harmful factor.

As to the economic problem of applying these results to the treatment of sewage-sick land, particularly with the view of ascertaining whether partial sterilisation of the soil causes increased purification of the effluent, or whether any modifying factors come into play when the experiment is conducted in the open field, besides an experiment with a number of small land filters filled with partially « rested soil », a series of small plots was laid out, the weights of turnips produced being, in thousands of pounds per acre :

Plot treatment	Untreated	Pared and burned	Treated with carbon disulphide	Treated with toluene
Total produce . . .	26.4 30.2	31.6	32.0	36.8

Larger plots of $^1/_{10}$ of an acre were set out on the Midland Agricultural College sewage farm at Kingston-on-Soar and drains were laid 18 in. deep, so that the effluents from each could be tapped. One of two pairs of comparable plots was treated with commercial « toluol » at the rate of 4 cwt. per acre, the injections being about 3 in. apart and 6 in. deep. General inspection showed that the effluent from the toluol treated plot was the better in each case both in colour and in smell, and the same fact is shown by the analyses of the effluents.

The present practical conclusion is that after the harmful factor is killed by partial sterilisation, the bacteria multiply rapidly and rise to high numbers, effecting more decomposition of the added sewage so that a purer effluent is obtained. No complicating factors appear to be introduced when the method is tried on a large scale, and it is little doubted that once the practical difficulties of partially sterilising large quantities of soil are overcome it will find useful application in sewage farm practice wherever the rate of decomposition is limited by the numbers of bacteria.

2. — **Russell and Petherbridge had already shown that partial sterilisation affords a satisfactory method of treatment of « sickness » in glasshouse soils, and trials made in commercial glasshouses have shown that it is also practicable on a large scale, especially in tomato and cucumber houses. Further conclusions are :**

I. Sickness in glasshouse soils is conditioned by at least two factors :

(*a*) an accumulation of insect and fungoid pests,

(*b*) a lowered bacterial efficiency.

II. The lowering of the bacterial efficiency is due to the accumulation of a factor detrimental to bacteria. This factor resembles in every way that present in arable soils ; it is put out of action by heat or by antiseptics ; in all respects its properties agree with those of protozoa.

III. There is no evidence that sickness is due to an accumulation of bacteria acting unfavourably on the production of plant food, *e. g.* denitrifying bacteria ; or that the beneficial effect of partial sterilisation is due to the destruction of such bacteria ; so far, it has been found that all bacterial actions are accelerated in partially sterilised soils.

As to the commercial treatment of sick soils, two general systems may be adopted: the soil may be heated to 90-100° C., or it may be treated with some antiseptics. These systems are fundamentally different. At 90-100° a certain amount of decomposition takes place, with formation of products having important secondary effects on the plant. Treatment of the soil with antiseptics causes much less decomposition, but certain secondary effects are seen in this case also. Thus, in discussing methods of treatment capable of application on a large scale, regard must be had not only to the cost and practicability, but also to

(*a*) the effect on the bacterial activity in the soil,
(*b*) the effect on disease and parasitic organisms,
(*c*) the secondary effects on the plant.

Exposure to a temperature of 96°-98° C. for two hours has proved the best method, because it not only kills destructive and parasitic organisms, including *Heterodera*, but also effects a certain amount of decomposition, thus lightening the subsequent work of the bacteria and bringing about certain secondary results, notably a great development of fibrous root. This treatment is practicable on a large scale, but the present cost of heating one ton of soil is about 1*s.* to 1*s.* 6*d.* A temperature of 55° C. maintained for 3 hours suffices to kill destructive and parasitic organisms and thus remedy sickness, but it does not effect the secondary changes.

An application of antiseptic may prove more convenient than heat if the purely mechanical difficulty of distribution is overcome. The antiseptic should be some cheap substance or mixture of substances that can:

(*a*) put out of action the factor injurious to bacteria;

(*b*) kill *Heterodera* and the spores of parasitic disease fungi in the soil;

(*c*) when its work is done disappear from the soil by volatilisation, oxidation or other decomposition, leaving no permanent bad effects behind;

(*d*) if possible lead to the same fine root development as a temperature of 98° C.

Russell and Petherbridge give a list of six classes of substances that more or less satisfy the first three conditions: formaldehyde; the lighter hydrocarbons of the tar oils — benzene, toluene, and the lighter homologues present in the so-called light solvent naphtha and heavy solvent naphtha —; the heavier hydrocarbons of the naphthalene fraction; the tar acids — phenol, cresylic acid, etc. —; the tar bases — pyridene and the homologues —; calcium sulphides. Of these the lighter hydrocarbons are not convenient for large scale work because of the cost of transport and the difficulty of application; the others are more suitable; they are carried at ordinary rates and are readily put on to the soil because they are or can be made miscible with water. Further investigation however is necessary to discriminate between the various substances; in the meantime it is insisted that no waste product should be recommended until it can be obtained to a definite specification, and the behaviour of its separate constituents is known.

3 and 4.—A somewhat different point of view is entertained by Stone and his pupils, of the Massachusetts Agricultural Experiment Station. They recognise the stimulant effects of soil sterilisation on plant growth, but they maintain that the benefits resulting from soil sterilisation depend upon the chemical and physical conditions rather than upon the number of protozoa.

Lodge and Smith have carried on three series of experiments with two types of soils, a loam rich in organic matter and a subsoil deficient in organic matter. 400 gr. of each soil were placed in a percolation tube and lukewarm distilled water was allowed to percolate several times through the soil; the percolated water was then placed in flasks, each flask containing 100 c. c. of percolate; then the decoction was subjected to steam pressure of 15 lb. for 45 minutes and at 121° C.

In series No. 1 a sterilised and unsterilised loam were used, and the sterilised decoctions inoculated with ordinary soil bacteria; the sterilised loam decoctions were found to contain a far greater number of bacteria than the unsterilised decoction. In series No. 2 a sterilised and unsterilised loam, and in addition a sterilised and unsterilised subsoil, were used, and the sterilised decoctions inoculated with ordinary soil bacteria; when a sterilized loam was used a greater number of bacteria were also found present than in the unsterilised loam decoction; but when a sterilised and unsterilised subsoil were used in the decoctions, a greater number of bacteria were found in the unsterilised decoction; this fact is assumed by the experimenters to prove that the sterilising of this particular soil resulted in adverse conditions for bacterial increase, and that decoctions made from different soils affect the growth of bacteria in a decidedly different manner. The remaining contents of the soil culture used in inoculating decoctions in the experiments of series Nos. 1 and 2 were subjected to a careful microscopic examination; no protozoa were found; neither were they observed to be abundant in a number of samples of the loam and subsoil. To avoid any possibility of introducing protozoa at the time of inoculating the decoctions, in the experiments of series No. 3 a sterilised and unsterilised loam and subsoil were used, as in series No. 2, but inoculations were made from a pure culture of *Bacillus subtilis*; the data given show that *Bacillus subtilis* multiplies in great numbers in all decoctions; a great number were found in the sterilised loam decoction as compared with the unsterilised and also a greater number were found in the unsterilised subsoil decoctions than in the sterilised decoctions.

The stimulating or retarding effects on the development of bacteria of the two types of sterilised soil used are similar to those produced in a previous experiment upon the growth of crops in these soils.

Growth of Soy Beans in Sterilised and Unsterilised Loam and Subsoil.

	Number of Pots	Average Length of Stems in Soil		Gain or Loss in sterilised soil
		unsterilised	sterilised	
	—	cm.	cm.	Per cent.
Loam	4	9.53	10.87	+ 14.05
Subsoil	4	9.79	4.14	— 17.70

These experiments, made with a different soil, would not confirm those of Russell and Hutchinson, who maintain that protozoa influence the number of bacteria in soils, since the development of bacteria differs in soil decoctions according to the composition of the soil used; that is, the number of bacteria which develop in a soil would depend upon the chemical and physical conditions rather than upon the biological conditions. These experiments, however, do not necessarily preclude the idea that protozoa might play a much more important rôle in soils other than those experimented at the Massachusetts Experiment Station, Amherst, Mass.

PROVISIONAL CONCLUSION.

I. It can be fairly stated, that partial sterilisation, especially of sick soils, may prove an efficient method of stimulating the development of bacteria and therefore of plant growth.

II. It is not equally sure if the limiting factor of bacterial growth be a biological, or a chemical and physical property of the soil; perhaps this factor may differ according to circumstances.

15 - Researches on Alkaline Meadows and Pastures.

FLODERER, A. (Chemist at the Agricultural Experiment Station of Magyaróvár, Hungary). A békésesabai szikes öntözött réten és legelön folytatott sziktanulmányokról. Országos m. kir növénytermelési *Kísérleti állomás*, Magyaróvárott. — *Kísérletügyi Közleményk*, Vol. XV, No. 3, pp. 390-418. Budapest, July-September, 1912.

The Agricultural Experiment Station of Magyaróvár has made at Békés-esaba during the last 10 years a series of experiments on irrigated alkaline meadows and pastures (« Szik ») to determine whether irrigation diminishes the amount of alkaline salts, or in other words, if the alkaline soils can be thus modified and improved. To obtain detailed data respecting the distribution of the salts in the soil, the writer made several borings on the same plot and studied, not only the superficial layer, but also the strata at depths of from 30-120 cm. (12 to 48 inches) and estimated the salinity of these. The summary of his results was as follows:

Irrigation produces a certain amount of lixiviation of the harmful salts; the diminution in soda, the alkali which is the most injurious to plants, being especially noticeable.

The removal of the salts, which is effected chiefly at the commencement of irrigation, together with the increased water supply, explains the maximum yields obtained during the first three years. The plants not only grew more vigorously, but the good species became predominant. The improvement takes place chiefly in the superficial soil. The richer the first stratum of 30 cm. (12 in.) is in salts, the greater is the improvement, for as the roots do not penetrate very far into stiff alkaline soils, the part played by the sub-soil is negligible.

In the case of a more intensive cultivation of the superficial layer, recourse must be had after some time to a systematic use of fertilizers. The manuring of alkaline soils only attains its ends if the former are improved to the point of growing the most useful plants in a satisfactory manner. Where the amount of alkali present is large in clay soils, only phosphatic and nitrogenous fertilizers are of advantage, potassic fertilizers are of no effect.

With regard to the powers of resistance possessed by various plants, sugar beets can grow in a soil containing from 0.15 to 0.2 per cent. of salts; but mangolds are able to develop in the presence of even larger quantities. Lucerne, on account of its long roots, can only be cultivated where the salts content is from 0.1 to 0.15 per cent., or at most, from 0.15 to 0.2 per cent. The presence of soda, however, greatly hinders its development. *Lotus corniculatus*, on the other hand, still grows in soils containing 0.2 to 0.3 per cent. of salts and 0.14 per cent. of soda; thus it resists alkalinity in the soil better than lucerne or red clover, the latter being a more delicate plant than lucerne.

16 – The Composition of Soil Suitable for Rubber Cultivation.

WOHLTMANN, F.: Südamerikanische und Ostafrikanische Kautschuk Böden. — *Der Tropenpflanzer*, Year 16, No. 11, pp. 571-581. Berlin, November, 1912.

The writer, Director of the Agricultural Institute of the University of Halle, has analysed samples of the soils which were most suitable for growing rubber and which had been sent from Brazil ("Seringal", Saõ Francisco, near Mt. Alegro), from Bolivia ("Seringal", Philadelphia, near Cobijia), from the higher basin of the Amazon and from German East Africa.

The following table gives some of the detailed results obtained by the writer.

In comparing the fertility of the soils of South America with those of German East Africa, it is necessary not to lose sight of the fact, that in the former country the annual rainfall is 120 inches, while in the latter it only amounts to 80 in. near Tanga and in East Usambara, and 48 in. in Morogoro. Thus, in the soils of South America the nutritive substances are more transportable and more easily assimilated than in the soils of German East Africa, which would only be as fertile as the former if they contained about 33 per cent. more of nutritive substances. The species of rubber trees cultivated are different in the two cases: *Hevea brasiliensis*, which requires an abundant rainfall, is cultivated in South America, and *Manihot Glaziovii*, which fares best in a dry climate, is grown in German East Africa. But the products obtained are chemically the same, whence it is believed that both species require the same, or nearly the same, soil.

Composition of some of the best rubber soils.

Type of soil	Source	Nitrogen	Lime	Magnesia	Phosphoric acid	Total potash
		per cent.	per cent.	per cent.	per cent.	per cent.
Fine loam	Seringal, Saõ Francesco, Brazil	0.085	0.050	0.116	0.076	0.233
»	Seringal, Philadelphia, Bolivia	0.124 – 0.147	traces	traces	0.026 – 0.038	0.272 – 0.442
Sandy clay	Tanga	0.077 – 0.225	0.180 – 0.360	0.023 – 0.042	0.039 – 0.052	0.027 – 0.033
»	East Usambara: Longusa	0 – 0.058	traces – 0.026	traces – 0.009	0.012 – 0.055	0.134 – 0.325
Typical red soil	East Usambara: Ngambo II	0.11 – 0.39	0.013 – 0.080	0.007 – 0.015	0.127 – 0.229	0.399 – 0.471
Red humic soil	East Usambara: Magunga	0.11 – 0.26	0.09 – 0.37	traces	0.28 – 0.35	0.32 – 0.46
Brown loam	Morogoro II.	0.09 – 0.16	0.18 – 0.253	0.29 – 0.43	0.111 – 0.174	0.616 – 0.871
Dark red soil	» IV.	0.12 – 0.15	0.073 – 0.127	0.051 – 0.081	0.055 – 0.149	0.34 – 0.48
Laterite	» V.	0.038 – 0.135	0.005 – 0.080	0.019 – 0.076	0.03 – 0.068	0.112 – 0.505
Medium red soil	» VI.	0.105 – 0.165	0.033 – 0.09	traces	0.08 – 0.12	0.341 – 0.533

This idea seems to be confirmed by the analytic results of the writer. He considers himself justified in deducing the following conclusions regarding the selection of a good soil for rubber trees :

1. Such a soil should be fine, of medium coherence, rather loose than heavy, and deep. The combined fineness and depth of the soil bring about a dampness, which appears to be indispensable to the formation of latex. Loams or clay loams with from 95 to 100 % of fine particles are the soils to be preferred, those rich in laterite, or iron compounds, are apt to be deceptive, while compact clays, and especially soils with extreme characters, should be rejected.

2. With regard to the nutritive substances :

a) It is not necessary that the nitrogen content should be high; a large percentage of humus is perhaps downright injurious ; 0.1 per cent. of nitrogen is sufficient, especially in districts with a large rainfall.

b) As for lime and magnesia, rubber trees only need very limited amounts of these substances. It is not yet known whether a high percentage of lime and magnesia hinders latex formation, or if the trees suffer in calcareous soils.

c) The rubber tree appears to have no special requirements as regards content in phosphoric acid.

d) It seems, on the other hand, that a large amount of potash in the soil promotes growth and the formation of latex; it is therefore advisable to use fertilisers containing potassic salts.

17 – Soils from the East Africa Protectorate.

Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 405-422. London, Oct. 1912.

Analyses of a certain number of soils from the East Africa Protectorate have already been published in the above Bulletin (1907, Vol. 5, p. 243), and a further series are now given

The results are tabulated in the accompanying table. The lime is deficient in almost all cases, except in the Jubaland soils. Phosphoric acid is also most consistently deficient whilst the nitrogen content varies considerably. The potash is abundant everywhere and an analysis of rock struck while sinking a well indicates that the source of these large supplies is andesite. In the Jubaland soils the soluble alkali salts are very high and would have to be taken into consideration in subsequent treatment. Applications of ground rock phosphate, ground limestone, and green manure are recommended to supply deficiencies of phosphates, lime and nitrogen respectively.

Analyses of Soils from the East Africa Protectorate.

Soil	Texture	Lime	Phosphoric acid		Potash		Nitrogen
		Sol. in HCl.	Sol. in HCl.	available	Sol. in HCl.	available	
Soysambu (1st series)	sandy loam	1.25	0.223	0.126	1.18	0.195	0.151
Njoro 1	sandy loam	0.34	0.023	0.003	0.245	0.015	0.202
» 2	sandy loam	0.36	0.24	0.003	0.259	0.033	0.181
Surface of well	clay loam	0.587	0.013	0.0007	1.239	0.068	0.009
Soysambu 1 (2nd series)	loam	1.900	0.054	0.005	1.665	0.113	0.164
» 2	sand	0.325	0.037	0.0018	0.995	0.059	0.009
» 3	sand	0.362	0.007	0.003	2.630	0.046	0.120
» 4	sandy loam	0.237	0.031	0.012	3.660	0.051	trace
» 5	sandy loam	0.435	0.041	0.009	2.804	0.092	0.140
Tana 1	fine loam	4.22	0.21	0.001	4.25	0.028	0.054
» 2	clay loam	2.47	0.20	0.0007	1.71	0.025	0.055
Jubaland 1	clay	3.89	0.18	0.022	1.35	0.030	0.080
» 2	sandy	2.04	0.04	0.016	0.85	0.031	0.05
» 3	loam	4.35	0.17	0.045	0.97	0.012	0.04
» 4	sandy	5.13	0.17	0.014	0.59	0.014	0.11
» 5	loam	7.50	0.19	0.002	0.61	0.007	0.09

18 - Irrigation in the United States.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION.

1. STABLER, HARRY SNOWDEN: The Safe Side of Irrigation Investments.

2. The Future of Irrigation. — *The Country Gentleman.* Vol. LXXVII, No. 38, pp 3. and 18, No. 40, pp. 4, 5 and 20, No. 47, p. 1. Philadelphia; September 21, October 26, November 23, 1912.

Seventy millions of dollars (about £14 400 000) have been invested by the United States Government in irrigation. Thirty-two reclamation projects, located in eighteen States, have been completed or are in process of development. At the end of the last fiscal year the operations completed included Government reservoirs with a capacity sufficient to irrigate 5 000 000 acres to a depth of one foot, 300 miles of canals, 1000 miles of ditches, 5 000 miles of watercourses, 20 miles of tunnels, etc. Further, the Reclamation Service will expend twenty million dollars (about £4 100 000) on irrigation works before the end of 1914. Water is now being served to 14 000 farm families. For 1911 the crop production on the irrigated territory was estimated at $12 000 000 (about £2 460 000). The Government still possesses about a quarter of a million acres of land for which water is available under completed or partly completed works.

Extent of Irrigation in the United States.

	Acreage irrigated in 1909	Percentage of total	Acreage that could be irrigated in 1910	Percentage of total	Acreage included in projects	Percentage of total
Arid region	13 739 499	100.0	19 335 711	100.0	31 112 110	100.0
United States Reclamation Service.	395 646	2.9	786 190	4.1	1 973 016	6.3
United States Indian Service.	172 912	1.2	376 576	1.9	879 068	2.8
Carey Act enterprises . .	288 553	2.1	1 089 677	5.7	1 573 874	8.3
Irrigation districts . . .	533 142	3.9	804 951	4.2	1 589 865	5.1
Cooperative enterprises .	4 646 039	33.8	6 194 677	32.0	8 845 437	28.4
Commercial enterprises. .	1 444 806	10.6	2 416 516	12.5	5 096 337	16.3
Individual and partnership enterprises	6 258 401	45.5	7 667 124	39.6	10 154 513	32.6

The valuation of the returns of the capital invested in irrigation schemes seems to Mr. Stabler to have been often exaggerated or referred only to the most favourable conditions possible: consequently it is not generally applicable, nor suitable to average conditions and to farmers of medium capacity. Further, in all districts in which irrigation is begun the prices of produce are much higher during the first years, and an investment of capital based on

the yield and profits of such a period would stand much probability of being a mistake.

Whilst a Government report states that well conducted farms under the rotation: lucerne, cereals, sugarbeets and potatoes, yield per acre 40 to 60 bushels of wheat; 75 to 110 of oats, 50 to 90 of barley, 300 to 500 of potatoes, 15 to 20 tons of sugar-beets and 4 to 6 tons of lucerne, the average yields of the above crops in 9 States of the arid region for which data are available, namely Colorado, Arizona, New Mexico, Wyoming, Utah, Montana, Washington, Oregon and Idaho, according to the last census were only: wheat 24.5 bushels; oats 37.1; barley 24.5; potatoes 144.6; sugarbeets 11.36 tons; lucerne 2.97 tons per acre; and in nine States in the humid region (Indiana, Illinois, Iowa, Wisconsin, Michigan, Minnesota, New York, Maryland, Mississippi) they were: wheat 16 bushels; oats 28; barley 21.6; potatoes 101.2. The figures for sugarbeets are lacking in the statistics. The author sets them down at over 9 tons per acre.

The development of an irrigated farm is always a slower and more costly undertaking than that of one which avails itself only of rainfall, as the former requires perfect levelling of the surface and the erection and upkeep of the irrigation works in addition to the strict farm operations.

The crops obtained by means of irrigation are burthened with the cost of the irrigation works and of the water rights, from which non-irrigated crops are free. This extra cost is partly offset by larger returns per acre, but the profits in turn are often reduced by the distance from market. Therefore this factor in relation to the kind of crops grown must be carefully considered.

The writer estimates as follows some items of the cost of production:

				per acre
Clearing of sage brush or other plants by drawing a heavy split log or steel rail with a team hitched to each end, across the land . . .	$	2	to 5	(8s. 3d. to £1 0s. 7d.)
Levelling the soil	,,	3	to 30	(12s. 4d. to £6 3s. 4d.)
Excavating the supply and distribution ditches and building the accompanying structures	,,	2	to 5	(8s. 3d. to £1 0s. 7d.)
Cost of applying water to the land	,,	1.50	to 3.50	(6s. 2d. to 14s. 5d.)
Average cost of maintenance and supply . . .	,,	1.07	to . .	(4s. 5d. to . . . .
Drainage: the cost differs very much. An average may be taken at	,,	15.		(£3 1s. 8d.)

The cost of drainage varies so much that it is difficult to estimate an average. It may be said, however, that from experiments made by the Government in reclaiming lands that had been alkalied or waterlogged and bringing them back to their former productiveness the average cost was close to $15 (£3 1s. 8d.) per acre.

In another Government publication is an estimate of expenses for the first two years' operations on a small irrigated farm in Arizona:

	$	£ s d
Land 7.2 acres at $100 per acre	720.00	147 - 19 - 0
Survey and papers	20.00	4 - 2 - 2
Levelling by contract	124.00	25 - 9 - 7
Fencing, head gate, pumps, small two-room cottage and shelter for horses	271.00	55 - 13 - 9
Team, wagon, plough, harrow, garden tools, mowing machine	615.00	126 - 7 - 6
Total preliminary outlay	$1750.00	£359 - 12 - 0

	$	£ s d	$	£ s d
First year — Cash for seed, water, crates etc.	127.92	26 - 5 - 9		
Second year — Cash for seed, water, crates, etc.	226.19	46 - 9 - 8		
Improvements	59.28	12 - 3 - 6		
Hired labour	72.00	14 - 15 - 11		
Total expenses for two years			485.39	99 - 14 - 10
Total cost			$ 2235.39	£459 - 6 - 10

The following data refer to another farm in a State farther north and are also taken from a Government bulletin: "The average cost of the first house built on a new farm does not exceed $450 (£92 9*s.* 4*d.*). The barn will cost $200 (£41 2*s.*) and a shed for tools $100 (£20 11*s.*). The necessary tools, such as ploughs, harrows, drills, mowers and binders, together with wagons, horses, harness, one cow, shovels, forks, and so on, will cost from $800 to $1500 (£164 8*s.* to £308 4*s.*), the average being probably $1100 (£226). To fence 160 acres of land with a four-wire barbed-wire fence, posts of cedar 40 feet apart, and brackets each 10 ft. apart, will cost $400 (about £82). A capital of $2500 (about £513) would be sufficient for a settler, provided he had enough money in addition to pay the first and second instalments on his land and water right. On 160 acres this payment would average $550 (£113) per annum." This is at $30 (£6 3*s.* 3*d.*) an acre for land and water.

There is no mention above of costs incidental to irrigation, so they are given here on an acreage of 80 acres.

	$	£
First two payments on land and water right	480.00	(98 12*s.*)
House	450.00	(92 9*s.*)
Barn	200.00	(41 2*s.*)
Tool-shed	100.00	(20 11*s.*)
Implements and stock	1100.00	(226 0*s.*)
Fencing	200,00	(41 2*s.*)
Clearing land	240.00	(49 6*s.*)
Levelling	400.00	(82 4*s.*)
Ditches and structures	240.00	(49 6*s.*)
Maintenance and supply — water rental — for 2 years	160.00	(32 17*s.*)
Cost of applying water for 2 years	240.00	(49 6*s.*)
	$ 3810.00	(£782 15*s.*)

This estimate holds good for Wyoming, Montana, Idaho, or the Dakotas. For a smaller acreage in Colorado, Washington or Oregon the outlay would be the same on account of the higher price of land and water rentals, both of which would be at least double; and in California they would be greater still.

In the Western States the fifty-five thousand different irrigation enterprises are capable of supplying water to nineteen million acres; of these about six million have not yet been sold.

19 - Availability of Nitrogen in Organic Ammoniates.

(1) COULSON, T. H. Availability of nitrogen in organic ammoniates. — *The American Fertiliser*, No. 10, Vol. XXXVIII, pp. 44-45. Philadelphia, Nov. 16, 1912.

(2) STREET, J. P. Note on the neutral permanganate method for the availability of organic nitrogen. — *The Journal of Industrial and Enginering Chemistry*, Vol. 4, No. 6, pp. 437-438. Easton, Pa., June 1912.

(3) JONES, C. H. Activity of organic nitrogen as measured by the alkaline permanganate method. — *Ib.*, pp. 438-441.

(4) HARTWELL, B. L. & PEMBER, F. R. The effect of the « wet process » on the availability of low grade nitrogenous materials. — *Ib.*, pp. 441-443.

The addition of phosphatic manures to organic materials is shown to interfere with the neutral permanganate method for estimating the availability of organic nitrogen; the use of small quantities of sodium carbonate in the process gave very satisfactory results, which agree well with those obtained by the alkaline permanganate method. The latter method gives useful information as to the quality of insoluble organic nitrogen in manures, this information being confirmed by vegetative trials.

The following analytical results are given:

1. Nitrogen as nitrates.
2. Nitrogen as ammonium salts.
3. Water-soluble organic nitrogen.
4. « Active » insoluble organic nitrogen (liberated by the alkaline permanganate process).
5. « Inactive » insoluble organic nitrogen.
6. Total nitrogen.

It was found that when the manure is derived from materials of high nitrogen content the figures given under the 4th heading are high in comparison with those given under the 5th, whereas when low grade materials have been used in the manufacture, the proportions are reversed. « Active » nitrogen is usually about 70 % of the total insoluble organic nitrogen, while with low grade materials it is 40% or lower.

The nitrogen in certain low grade materials, such as peat, garbage, tankage, roasted leather, is of a very low availability, but manufacturers claim that treatment by the so-called « wet process » completely changes its chemical and physical nature and materially increases its availability. Samples of such materials were taken before and after the process and yielded on analysis:

	Percentage of total nitrogen	
	Before treatment	After treatment
As ammonium salts.	6.5	14.3
As water-soluble org. matter	7.8	57.7
As water-insoluble org. matter . . .	85.7	28.0

From this the conclusion was drawn that when low grade ammoniates are used for making base goods by the « wet process », a large percentage of the nitrogen is rendered highly available for plant use.

All the above results were the work of a committee appointed by the directors of the Agricultural Experiment Stations of the New England States, New York, and New Jersey to investigate by laboratory methods the availability of organic nitrogen.

20 – The Fertilizer Trade in the Netherlands.

Communication from the Netherlands General Direction of Agriculture.

The General Direction of Agriculture, Division VI (Publications and Statistics), has compiled expressly the following table concerning the present condition of the production, importation, exportation and consumption of fertilizers in the Netherlands.

Production, importation, exportation, and consumption of fertilizers in the Netherlands in 1910.

Description	Production metric tons	Imports m. t.	Exports m. t.	Total consumption m. t.	Consumption by Co-operative Societies m. t.
Nitrate of soda	—	164 826	107 218	57 608	34 783
Sulphate of ammonia	10 000	31 031	23 473	17 558	3 658
Potash salts.	—	175 212	9 597	166 615	94 783
Basic slag	—	195 719	101 578	94 141	76 366
Superphosphates	150 000	—	—	90 000	62 865

To this table, which gives a good idea of the fertilizer trade in the Netherlands, the following information may be added as to the method used in obtaining the above data.

The total consumption of nitrate of soda was calculated by subtracting the amount exported from the quantity imported.

The production of sulphate of ammonia was estimated in 1907 at 10 000 metric tons. In comparing the amount purchased by the co-operative societies with the total consumption, the latter seems too high, perhaps on account of an error in the estimate of the production. In fact, according to a communication made to the International Institute of Agriculture by the

"Gemeente Gasfabrieken Hoofdkantoor," the production of the gas factories alone does not exceed 5 293.39 m. t. (1910).

The total consumption of potash salts and of basic slag has been estimated in the same manner as that of nitrate of soda. According to the data of the German "Kalisyndicat," the consumption of potash salts in 1910 was 178 000 m. t.

Some years ago, the annual production of superphosphate was estimated at 120 000 m. t., but a new factory having since been started, the present output may be reckoned at 150 000 m. t. There is a discrepancy in the importation and exportation figures, but this arises from the fact that they include much raw phosphate. Nevertheless, as the total consumption of superphosphate was estimated some years ago at 60 000 m. t., if these figures were correct, 90 000 m. t. is not too high an estimate for the present consumption.

21 - Phosphates and Nitrates in Egypt. Their Importance to European Agriculture.

1. POLIER. La richesse agricole et minérale de l'Egypte. § 3 Les richesses minerales de l'Egypte. 8. Phosphates et Nitrates. — *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Vol. 118, No. 2, pp. 232-272 (268-270). Paris, August, September, October 1912.

2. STUTZER, O. Phosphate, Sonstige Phosphatlagerstätten Afrikas. — *Die Wichtigsten Lagerstätten der "Nicht-Erze"*, First Part, pp. 363-364. Berlin, 1911.

The discovery of large deposits of phosphate and nitrate in Egypt would be a very important matter, not only for Egyptian agriculture, since constantly increasing quantities of fertilizers are imported into the country, but also for the European agriculturist, who makes use of enormous amounts of these substances.

Nitrates. These have to be left out of consideration, for though large deposits of nitrate have been discovered in the Nile valley, the high proportion of sodium chloride they contain renders them useless. Further, they do not form crystalline masses, but are simply saliferous clays. The result of prospecting seems so far to be negative.

Phosphates. The phosphate deposits, on the other hand, appear likely to be a source of wealth to the country. Their presence has been observed at a large number of places all situated in a zone which, on the west of the Nile, includes the oases of Dakha and Kharga, while on the east it leaves the Nile between Keneh and a point south of Esneh, and stretches to the north-east up to the Red Sea, at Safadja and the west coast of Sinai. Outside this broad band, phosphate deposits have been found in the oasis of Baharia and quite to the south-east of the frontier of Egypt in the valley of Wady Hodein, on the shores of the Red Sea.

The principal known deposits are the following:

1. The first was discovered in the Nile valley 11 miles south of Esneh. A second was found on the plateau called Djebel el Qurm; this is 0.6 to 1.2 miles wide by 5 ½ long. The nearest station is 6 miles

distant, but connection with the railway could easily be effected. A third deposit is at Sebahia. The samples taken have yielded 70 % of tribasic phosphate.

2. An English Company has obtained concessions at Safadja on the shores of the Red Sea, but as no details of results have been divulged, the probabilities are that they have not been of a satisfactory nature.

3. The richest deposits are without doubt those of Rachid, in the Daklah Oasis. They extend throughout the whole length of the latter for a distance of at least 31 miles. The average thickness of the workable stratum varies from 6 to 10 ft. The bulk of the deposits occurs always on the edge of the desert on the borders of the cultivated land, and their exploitation would be a very easy task. Unfortunately, the Oasis of Daklah is in the open Libyan desert 370 miles from the Nile Valley. But lately the railway has been carried as far as the Oasis of Karghah, which is only 93 miles from that of Daklah.

Thus it is at Daklah that the prospects of Egyptian phosphates appear most brilliant. They have not escaped the notice of the Gafsa Phosphate Company, who are known to possess a quasi monopoly of the trade.

22 - New Methods for determining the Comparative Value of Selected Plants.

SELECTION.

1. HUMMEL, A. Massenanbauversuche. — *Illustrierte Landwirtschaftliche Zeitung*, Year 31, Nos. 88 and 89, pp. 821-824 and 829 + figs. 922-924. Berlin, Nov. 4 and 8, 1911.
2. BILGER, O. Zur Methodik der Sortenprüfung. — *Ib.*, YEAR 32, No. 91, pp. 827-829 + figs. 898-900. Berlin, Nov. 13, 1912.

Formerly, selected seeds were tested in the laboratory; now on the contrary, experiments made in the field are considered the most satisfactory. This has given rise to the development of comparative cultivation experiments of the new selected varieties, *e. g.* those carried out by the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft), which have risen in number from 562 in 1905, to 726 in 1911. Of these 164 in the former year and 250 in the latter were devoted to oats.

The principal difficulty in such experiments is the avoidance of experimental errors, which prevent an exact estimation of the productivity of the new varieties. In Denmark and in Sweden, where such experiments are much practised, they are repeated on the same soil for from 3 to 8 years in succession. The new method proposed by Hummel and named by him the "compensation method" has the advantage of giving more immediate results, and consists essentially in the two following calculations:

1) Take the arithmetical mean of the results in absolute figures for every variety; to this, taken as 100, the results obtained from every plot of the same variety are referred, and thus all the results are given in percentages of the arithmetical mean for every variety submitted to experiment.

2) Take successive groups of 9 contiguous plots forming a large square, find for each group the arithmetical mean of the results referred to 100 as above; the difference between this figure and 100 represents the mean deviation of the square from the average of the whole experiment field. Then add this amount to the figure of the central plot, or subtract it, according as to whether it is negative or positive, and repeat the operation for all the plots.

The percentages thus corrected are recalculated in absolute figures, and to these the calculation of the probable errors is applied by means of the formula:

$$\frac{\Sigma \pm d \,.\, 0.845}{\sqrt{n\,.\,(n-1)}\,.\,\sqrt{n}}$$

— where Σ is the sum of the separate results, d the difference between the separate results and the average, and n the number of the plots for every variety, 0.845 being a constant.

Now, calculating the probable error (by means of such a formula) in the direct experimental data and that in the data obtained by the proposed method, it will be found that this last is less.

In fact, in the practical case of the two comparative experiments made with 30 varieties of beans in a series of 6 lots and with 20 varieties of rape in a series of 5 lots, the probable average error for the whole experiment was reduced respectively from ± 9.19 to ± 6.90 and from ± 4.48 to ± 3.54 in percentage of the average.

In conclusion, the advantages of the new method proposed would be:

I. By means of the "compensation" calculation, part of the experimental errors which are inherent in comparative cultivation experiments are eliminated, and the sources of error are thus limited to those dependent on the separate lots.

II. Such errors as cannot thus be eliminated, are expressed in figures; thus the results can be subjected to mathematical criticism.

III. Selection having for its object the increase in the yield of cultivated plants, is thus placed upon a surer and more fitting basis.

23 - Cultural Bud Mutations of *Solanum immite* Dunal.

HECKEL, ED. Mutation gemmaire culturale du *Solanum immite*, Dunal. — *Comptes Rendus de l'Académie des Sciences*, Vol. 155, No. 18, pp. 804-806. Paris, Oct. 28, 1912.

After referring to his previous researches on the mutations of *Solanum tuberosum* L., a species growing wild in Bolivia and Peru, the writer gives the results he obtained with *Solanum immite* Dunal, which was brought by M. Verne from Chancay (north of Lima, Peru), that is the classic habitat of this species. In Chancay a complete mutation in the tubers and all the subterranean portions of the plants was obtained, although the tubers had only attained a slight degree of development (10 to 12 gr. maximum); further, the productivity of the plant appeared previously to be very small, for two specimens only bore 3 tubers; the latter however showed mutations. The writer did not consider the arguments for making *Solanum immite* a separate species sufficiently conclusive, and after having cultivated it a long time, he believes it should be regarded as identical with *S. tuberosum* L.

Its behaviour under cultivation (intensive fertilizing) as regards the mutation of its tubers, shows other points of similarity with *S. tuberosum*.

The mutation found in the latter occurred in one year, and this is the first time that M. Heckel has observed such a rapid change, which was at the same time far-reaching, affecting the various parts of the tubers and the stolons, which are very plentiful in the wild plant. In other cases, the mutation was slower, and attended by greater difficulties; sometimes in fact it did not occur (*Solanum Comersoni* and *S. Maglia*). The fact of the rapidity of mutation in the tubers in the type *S. tuberosum* and in *S. immite* Dunal perhaps explains the classic attribution of all cultural varieties to the wild *S. tuberosum* L. of Peru. This variety has no doubt accommodated itself to cultivation and to the production of edible tubers more readily than other wild species, and so quickly that it has been given the preference in cultivation over other kinds.

Once it has given rise to a mutation, it appears to produce varieties, which have tubers of different colours and shapes. This will be seen next season, in which all the tubers, both mutated and non-mutated, from the crop of 1912 will be used.

The writer obtained mutation in *S. Maglia* and *S. Commersoni* under conditions which show the slowness and the difficulty of this change.

No mutations have so far occurred in the tubers of *S. Jamesii* Torray, which has been cultivated for three years.

24 - *Solanum Immite*, a New Species of Potato from Peru.

DENEUMOSTIER, CHARLES. Le *Solanum immite*, nouvelle espèce de Pomme de terre alimentaire du Pérou. — *Annales de Gembloux*, Year 22, Part 11, pp. 621-624, 6 plates. Bruxelles, Nov. 1, 1912.

Sr. N. Esporto, Botanical Assistant at the National Agricultural and Veterinary School at Lima, found in the lomas (1) of Pasamayo, prov. of Chancay, from 1906-1907, the species of *Solanum* which has a tuberous rhizome and which had been found for the first time about 1790 by Pavon, and been preserved in de Boissier's herbarium. It was determined by Dunal, who gave it the name of *S. immite* and considered it to be a distinct species. This *Solanum* was much sought after by the North Americans especially and it was regarded with interest as the possible origin of a new edible potato.

Selection and improvement experiments were carried out on this species at the Lima School and the results obtained showed that the yield and the tubers (weight and size) were capable of improvement.

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(1) Lomas = winter pastures on the high parts of the spurs of the Andes.

Its nutritive proprieties (at any rate as a feed for animals) are undoubted, judging by the eagerness of the pigs which are turned out in the "loma" during the winter season.

The tubers were placed in pots in April 1910; their weight varied from 0.5 to 5 grams. In September, about 300 tubers were harvested; their weight was from 0.5 gr. to 30 gr.

These were carefully preserved and planted in 1911, after having been classified according to size. They were planted in soil which had not been fertilized for a long time and where mulberry trees had grown for the last 5 years.

It was desired to obtain for 1911, a series of complete plants from which a first supply of tubers to be intensively cultivated with suitable manure could be picked out. Forty-five plants were separated out, of which the yield and vegetative characters were well known and which will form the point of departure of new selection experiments. The following figures give an idea of the first crops obtained.

The field was divided into six lots, of which three of 6 ft. 6 in. × 13 ft. were planted with the larger tubers. The crops were respectively 4.73 lbs., 5.03 lbs. and 9.41 lbs., with an average weight per plant of 113.376, 127.161, and 129.670 grams, while the average yield of the wild *S. immite* was only from 21 to 25 grams.

Plot IV (6 ft. 6 in. × 13 ft) yielded 5.47 lbs.; plot V (6 ft. 6 in. × 13 ft.) yielded 6.79 lbs.; the number of plants was not accurately known. Plot VI (13 ft. × 13 ft.) produced 23.52 lbs. The following are some yields of separate plants; the weight is given in grammes:

173.10; 171.10; 180.60; 186.90; 192.50; 197.50; 206.20; 218.20; 232,20; 240.50; 280.40; 283.25; 311.75; 429.35; 460.80; 548.31; 667.45.

The writer calls special attention to the plant which had a tuber yield of 548.31 gr.; the rhizomes were superficially arranged, several of the neighbouring tubers were disposed in a parallel manner and belonged to different chains, of which four could be distinguished. It was observed that this plant possessed two well-developed stems above ground.

CEREAL AND PULSE CROPS.

25 – Recent Scientific Investigations Described in the First Collective Report of the Experiment Station for Cereal-Testing.

Wissenschaftliche Neuforschungen aus dem Ersten Sammelbericht der Versuchsanstalt für Getreideverarbeitung. pp. 206-210. Berlin, 1911.

A. *Characteristics of German Cereals. Bread-making properties of rye and wheat meal.*

I. Rye. The dough and bread-making properties of the 13 samples of rye examined (12 Petkuser and 1 Probsteier) were found to be excellent and to fulfil adequately all the technical requirements. Average dough yield was ascertained to be 155-158 grams, and bread-yield 138-149 grs. per 100 grs. of flour. The volume of the bread should be 300 cc. per 100 grs. air-dry flour, or at least, not fall far below this figure.

II. Wheat. The extensive data resulting from the examination of 26 varieties of wheat showed that local varieties were much superior to intersively selected ones in bread-making properties, while very inferior in yield. Usually, good baking local wheats have the higher gluten content . When mixed with other wheats, the selected highly productive varieties lose their defective properties and generally produce flour and bread of good colour.

Statistical estimate :

	Gluten			
	damp	dry	Dough yield	Volume
First grinding	32.0	10.1	162-163	376
Second grinding	33.7	11.1		420

The gluten content of the first grinding is usually 1 % lower than that of the second grinding, but the gluten of the first is softer, less firm, and has a greater power of taking up water.

Further, flour of 21 varieties of winter and 12 of spring wheat were examined.

Average of factors determined :

	Gluten			Volume	
	damp	dry	Dough yield	Household bread	Fancy bread
Winter wheat	30.0	10.0	170	415	390
Spring wheat	36.0	11.9	172	437	407

There is without doubt a certain relation between the amount of gluten present and the volume of the bread : a very low gluten content produces loaves of small volume, while the largest loaves are usually the result of using a flour which is rich in gluten.

The gluten content appears to show no parallelism with the quality of the bread.

B. *Characteristics of some foreign wheats.*

The North American wheats are distinguished by short firm gluten, and the bread made from them alone is inferior in quality; they are, however, very suitable for mixing with tenacious and soft wheats. The South American wheats have usually very extensible, soft gluten and the flour and bread made from them are soft and have a large volume, but the dough tends to be deficient in elasticity.

	Gluten			Volume	
	damp	dry	Amount of dough	Household bread	Fancy bread
Average	40.4	12.9	171	427	408

C. *Nitrogen content and distribution in native wheats.*

Experiment showed that there was no close connection between the nitrogenous substances of different degrees of solubility and the quality of the flour. There seems, however, to be a connection between the constitution of the gluten and the amount of alcohol-soluble portion of protein, for firm short gluten contains less of the soluble part than does soft extensive gluten, but the behaviour of the flour, as a whole, does not depend upon the alcohol-soluble protein.

Protein which is soluble in water is also of no importance in estimating the quality of wheat flour.

D. *The Effect of manure on the composition and kneading properties of rye and of wheat.*

1. The use of chemical fertilizers as a rule slightly increases the weight per bushel; and potash fertilizers in no way injure this quality of the wheat.
2. There appears to be no clear relation between the weight per 1000 grains and the use of a fertilizer.
3. Complete manuring generally produces an increase in protein.
4. The ash content is not made higher.
5. The fat content remains the same.
6. The hydrocarbons, which behave in an almost opposite manner to protein, decrease slightly.

There is no regular connection between the amount of flour and the use of fertilizers.

Baking experiments showed, that the qualities distinguishing good flour: amount of dough, and the weight and volume of the loaves, are not affected by a complete fertilizer, at least in the case of rye. No satisfactory decision has been arrived at with regard to wheat, as the experiments made have been few and not extensive.

26 - Comparative Experiments in Barley Cultivation.

VARGA KALMAN. Összehasonlító árpatermesztésikisérletek. *Köztelek*, Year 22, No. 89, pp. 3051-3052. Budapest, November 16, 1912.

In Hungary, the value of brewing barley depends much on the date of its ripening, and therefore it is a mistake to introduce barleys from northern countries, which are late and usually shrivel during the great heat in July and become useless in the manufacture of beer.

Three years ago, the idea spread that "Hofbräu", "Golden melon", and "Probstei" varieties could be compared to "Hanna", which is especially suitable to Hungary.

From 1909 to 1911, the writer made a series of comparative experiments with the above-named varieties in order to ascertain: 1) the precise date of their ripening, 2) the influence exercised upon their quality by the application of nitrate, used with or without superphosphate. The experiments were carried out on plots belonging to the Agricultural Academy of Kassa in North Hungary, on deep and fairly heavy soil.

The barley always followed potatoes and the treatment of the soil was identical in both cases.

The data obtained respecting the average date of ripening are given in Table I.

TABLE I.

Varieties	Date of sowing			Date of germination			Date of tillering			Date of earing			Date of ripening		
	1909	1910	1911	1909	1910	1911	1909	1910	1911	1909	1910	1911	1909	1910	1911
Probstei	IV/4.	III/25.	IV/7.	IV/18.	IV/3.	IV/21.	V/8.	V/12.	V/4.	VI/6.	VI/12.	VI/15.	VII/19.	VII/20.	VII/16.
Golden-Melon	IV/4.	III/25.	IV/7.	IV/20.	IV/12.	IV/23.	V/10.	V/12.	V/16.	VI/10.	VI/14.	VI/16.	VII/19.	VII/22.	VII/18.
Holstein	IV/4.	III/25.	IV/7.	IV/22.	IV/11.	VI/24.	V/8.	V/16.	V/18.	VI/13.	VI/16.	VI/12.	VII/25.	VII/26.	VII/23.
Hanna	IV/4.	III/25.	IV/7.	IV/18.	IV/3.	IV/21.	V/5.	V/4.	V/10.	VI/5.	VI/1.	VI/7.	VII/13.	VII/18.	VII/12.

TABLE II.

Varieties	Fertilizer used per acre	Average yields in 1909, 1910, 1911				Average percentage of protein	Average weight lb. per bushel
		Average weight per 10 shocks		lbs. per acre			
		Grain	Straw	Grain	Straw		
		lbs	lbs				
Hofbräu .	No fertilizer . .	5 291.09	8 157.09	1 332.80	1 551.36	10.66	51.60
	93 lbs nitrate . .	5 621.78	8 598.02	1 271 24	2 718.48	12.85	51.60
	232 lbs superphosphate	5 401.32	8 377.56	1 488.02	2 856.04	10.70	52.00
	232 lbs superphosphate . . . . 93 lbs nitrate . .	6 062.71	8 598.02	1 643.25	2 418.48	10.80	52.00
Probstei . .	No fertilirer . . .	6 613.86	11 243.56	1 550.47	2 852.04	11.20	50.40
	93 lbs nitrate . .	7 054.78	12 125.41	1 828.81	2 868.10	12.80	50.40
	232 lbs superphosphate	7 165.02	11 904.95	1 844.86	2 914.49	11.00	52.80
	232 lbs superphosphate . . . . 93 lbs nitrate . .	7 275.25	11 904.95	1 736.03	2 944.82	11.30	52.80
Golden-Melon	No fertilizer . .	5 291.09	7 275.25	1 488.02	1 519.25	10.50	54.00
	93 lbs nitrate . .	6 172.94	8 377.56	1 736.03	1 565.64	13.10	54.40
	232 lbs superphosphate	6 062.71	7 716.17	1 704.80	1 550.47	11.80	54.40
	232 lbs superphospate . . . . . 93 lbs nitrate . .	6 613.86	7 826.40	1 860.03	1 828.81	11.80	54.80
Hanna . . .	No fertilizer . .	5 952.47	7 716.17	1 674.47	2 015.25	9.80	54.80
	93 lbs nitrate . .	6 062.71	8 598.02	1 704.80	2 015.25	10.20	54.96
	232 lbs superphosphate	6 724.09	7 936.65	1 844.86	2 480.04	9.90	52.64
	232 lbs superphosphate . . . . 93 lbs nitrate . .	7 826.40	9 038.94	1 891.25	2 464.87	9.85	54.40

It will be seen by this table that the "Hanna" variety is the earliest, next come "Probstei" and "Golden Melon", which can also be cultivated in this part of Hungary, but "Hofbräu" is too late to be grown profitably.

The comparative experiments in cultivation and manuring are shown in Table II.

It will be seen from this table, that the yields were increased by the use of fertilizers, that a nitrogenous fertilizer increased the protein content (a good brewery barley should not contain more than 9 per cent of protein) and that nitrate is only injurious in this respect if by means of the application of this fertilizer, the soil contains an excess of nitrogen in proportion to the potash and phosphoric acid present. Nitrate used alone increases the protein content 1.69 per cent, if superphosphate is applied at the same time, the increase is only 0.39 per cent.

27 – Rice Culture in the Philippines.

CONNER, CHAS. M. and MACKIE, D. B. *Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture,* Bulletin No. 22, pp. 40 + XXII plates. Manila, 1912.

In the Philippine Islands during the fiscal year 1911, 1 043 757 hectares (2 579 228 acres) of land were cultivated in rice, producing 882 794.13 metric tons (1 945 677 976 lbs) of rough rice (palay). The area cultivated in rice is 94.5 per cent of the total areas cultivated in abacá (*Musa textilis*). coconuts, sugar, corn, and tobacco. The crop is valued at £6 220 755 ($ 30 897 795) representing 65.9 per cent of the total value of the above named crops. Counting the population at 8 886 314 there is one hectare (2.47 acres) of rice cultivated to every 8.5 persons.

The following table shows the area cultivated, total yield, and average yield, and average yield per hectare.

Table No. 1. Rice Crop in the Philippine Islands.

Fiscal years	Total area cultivated (hectares)	Total amount of rough rice produced		Average per hectare	
		Metric tons	Equivalent in cavans (1)	Kilos	Equivalent in cavans (1)
1909	1 156 105	747 942.69	17 394 016	646.95	15.05
1910	1 192 141	810 940.70	18 859 086	680,24	15.82
1911	1 043 757	882 794.13	20 530 096	845.49	19.67

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(1) The people throughout the country measure rice by the cavan, the average weight of which is 43 kilos (94.6 lbs) for rough rice (palay) and 57.5 kilos (126.5 lbs) for cleaned rice.

Rice seems to grow well on almost any of the different types of soil. The only essentials are that the soil be fairly fertile and that it have a layer of impervious clay beneath.

At the present time the great majority of rice growers depend upon rain water for growing their crop. As a rule only one rice crop is grown, which is planted at the beginning of the rainy season. The rice-growing provinces may be divided into two groups, those that have a pronounced wet and dry season, and those that have their rainfall distributed more or less throughout the year. Most of the former are located within the Plain of Luzon; and the latter are near the Pacific coast or towards the south. It is estimated that it takes at least 100 to 116 hectare-centimeters of water to grow a normal rice crop, provided it is evenly distributed over the growing season. The average rainfall for the five rice-growing months (June-October) in those provinces having a pronounced wet and dry season is 1556 millimeters. In such localities irrigation is destined to play a great part in rice growing: firstly because rice can be planted at the best time for its development, and secondly, two crops may be grown each season.

About 50 587 hectares (125 056 acres) are now under irrigation; 485 640 hectares (1 200 065 acres) may be easily brought under modern irrigation. This work is going forward rapidly.

About four-fifths of the rice grown is transplanted. One-twentieth of the area to be planted is required for the seed bed. In some sections where water is less scarce two crops of rice are grown each year, and the second or short-season crop is sown broadcast.

Weeds and grass do not give much trouble in those sections where there is a pronounced dry season and where irrigation water is not available. The rice is harvested about the close of the rainy season and the fields are used for pasture during the rest of the dry season.

Cases may be cited where large areas have been grown in rice for at least one hundred years and still produce good crops without the use of fertilisers.

Upland rice is sown on the hills and, as a rule, on new land. The rainfall is depended upon for moisture. The rate of seeding is about 64.5 kg. per ha. (57.6 lbs per acre). The average yield from upland rice is not more than one-half that of transplanted rice, nor is the quality considered as good. If the stand is not even, weeds and grass give considerable trouble. The same varieties may be used for this method as for the caiñgin method; this consists in burning the underbrush and trees on the hills and sowing the rice in holes, without ploughing, when the rains begin; the land is not planted a second time but allowed to cover itself with young growth for three or four years' when it may be cut over and used again. Crops of rice grown in this way may exceed in yield crops grown in the regular way.

There are a few localities where a short rotation is practiced; for example, in sections of Tarlac and Pampanga sugar cane is rotated with rice. In some parts of Laguna and Batangas corn is rotated with rice to good advantage. In many sections mungos are planted on the rice fields during the dry season.

The following is the estimated cost of production of 1 hectare (2.47 acres) of rice according to 230 answers to an enquiry made by the Board of Agriculture.

Estimated cost of 1 *hectare*,

Preparation of seed bed	P. 2.25
One cavan of seed (when sown broadcast 1 ½ cavans)	» 2.50
Plowing one hectare — one man and carabao (1) 10 days at P. 1.25 per day	» 12.50
Harrowing and putting in order for transplanting: one man and carabao eight days at P. 1.25 per day	» 10.00
Transplanting: twenty women and children at P. 0.40 per day	» 8 00
Cost of harvesting and threshing	» 21.50
Total estimated cost	P. 56.45 (2)

When the crop is harvested on shares, the harvesters get from one-fourth to one-tenth, depending upon the condition of the crop, but the general average seems to be one-fifth.

When the land is rented and the farmer has his own work animals, plows, etc., the owner of the land gets from one-third to one-half the crop. If the owner of the land furnishes the animals, plows, etc., the farmer gets one-fourth.

Threshing is still done in most localities by tramping out with the feet, pounding with a flail, or tramping with carabaos. However, steam threshers are being used more generally each year in the large rice-growing districts.

One hundred kilos rough rice, or palay, will give about 65 kilos of cleaned rice. Much of the rice that is used locally is cleaned by pounding in a large wooden mortar. But there are a number of large rice mills in the Islands properly equipped for making good marketable rice. There are also some two hundred and fifty small mills requiring engines of 6 or 8 horse power to operate, which clean rice for local use. There are only two grades of by-products: "binlid" or broken rice and "tiqui-tiqui" or rice bran.

Of the 910 varieties of rice collected by the Bureau of Agriculture of the Philippine Islands, 452 were found to be lowland and 458 upland; 134 of the lowland and 6 of the upland were bearded. The detailed results of variety tests are shown in a number of tables. The earliest lowland variety matures in 118 days; the latest in 209 days.

Except for making the planting and harvest fit in with the average weather conditions there is no occasion for growing a variety that requires more than 150 days to mature.

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(1) Buffalo of the Malay Archipelago. (Ed.)

(2) 1 P. = $ 0.5 = 2s 0.1d.

The average yields of the lowland varieties tested were as follows:

White, non-glutinous, beardless varieties:

33 or 20.6 % gave less than 1000 kilos of palay per hectare.
58 » 36.2 » ranged between 1000 and 2000 kilos of palay per hectare.
69 » 43.1 » » » 2000 » 3400 » » » » »

White, non-glutinous, bearded varieties:

5 or 4 % gave less than 1000 kilos per hectare.
66 » 53.6 » ranged between 1000 and 2000 kg. per ha.
52 » 42.3 » » » 2000 » 2800 kg. per ha.

Red, non-glutinous, beardless varieties;

6 or 12.7 % gave less than 1000 kg. per hectare.
19 » 40.4 » ranged between 1000 and 2000 kg. per ha.
22 » 46.8 » » » 2000 » 3000 kg. per ha.

Four hundred and fifty-eight upland varieties were tested; the data relative to 25 of them are tabulated. The earliest of these matures in 126 days; the latest in 141; the yields varied from 2665 to 4554 kilos of rough rice (palay) per hectare, being, on the average, higher than those for lowland. One explanation for the short range in the ripening period of the upland varieties is that they tend to mature as soon as the rains stop. Four varieties were found which have the grains arranged in bunches of three, much after the fashion of wheat, which is rather unusual. Unfortunately all of these have very dark or black grains which render them unfit for general use.

Rice pests. Rats have been the most numerous and destructive of all pests. Four distinct species have been found, a large brown rat, probably *Epimys norvegicus* Erxleben, being the must numerous.

Birds. — In some districts seed-eating birds often are very destructive, the "mayas" *Munia jagori* Martens, and *Uroloncha everetti* Tweed (Ploceidae) being the most numerous. Two ducks, *Anas luzonica* Fraser and *Dendrocygna arcuata* Horsf., are also destructive; the former seems to prefer fresh water streams and the latter the salt water "esteros."

Insects. — The rice is subject to the attacks of: 1) locusts; 2) moth borers spending the larval stage within the stem (*Schoenobius punctellus* Zell. and perhaps other species); 3) rice-worm (*Spodoptera mauritia* Boisd.), often parasitized and held in check by Tachina flies; 4) rice butterflies (*Melanitis ismene* Cram., — a Nymphalid, and an undetermined species of Hesperid) feeding upon the leaves of the growing rice; 5) rice bug (*Leptocorisa acuta* Gem.) sucking the juice from the ripening grain; 6) rice weevil (*Calandra oryzae*) often found in stored palay and also crawling about on the ripening heads of grain.

Fungi. — A smut, identified by Merrill as *Ustilago virens*, has been found on upland rice at Lamao, Bataan Province. Another species very much like *Ustilago virens*, but with brown or sooty spores, was noted by Mr. D. B. Mackie on rice growing on Catanduanes Island. Rusts have been reporteed from various sections, but they rarely do any damage.

28 - The Branching Habits of Egyptian Cotton (1).

Mc LACHLAN, ARGYLE: *U. S. Department of Agriculture. Bureau of Plant Industry,* Bulletin No. 249, pp. 28 + 3 plates. Washington, 1912.

The excessively large size of the vegetative branches or limbs on Egyptian cotton plants grown under irrigation in the Colorado River Valley in Arizona and California occasions difficulties in cultivation and harvesting, and causes the development of normal fruiting branches to be postponed. To place the growing of Egyptian cotton in the Southwest on a practical basis, cultural control of the production and development of vegetative and fruiting branches must be established. A study of the branching habits of Egyptian cotton is necessary as a preliminary investigation of this problem.

The present paper gives the results of investigations of the branching habits of Egyptian cotton carried out in Arizona and in Colorado during the seasons of 1909 and 1910. The following conclusions are reached:

" The Egyptian cotton plant bears two kinds of branches, long vegetative branches on the lower part of the stem, which bear no flower buds directly, and above these, to the top of the plant, shorter fruiting branches which bear flower buds.

The differences between vegetative branches and fruiting branches are very sharp: 1) Vegetative branches usually approximate the length of the main stem, while fruiting branches are about one-third as long. 2) Vegetative branches bear no flower buds except as they produce secondary fruiting branches. Fruiting branches bear a flower bud at each node opposite the leaf. 3) The vegetative branches, like the axis, bear fruiting branches and may bear vegetative braches. The fruiting branches rarely bear fruiting or vegetative branches.

Vegetative branches may be either axillary or extra-axillary. Normal fruiting branches are always extra-axillary. Single bolls or short fruiting branches are sometimes developed from buds in the axillary position, at nodes bearing fruiting branches. Such branches may be regarded as secondary fruiting branches borne by the axillary vegetative branch, which is itself suppressed.

From 6 to 8 vegetative branches are usually produced from the first 10 nodes of the axis. At the next 2 or 3 nodes the buds frequently remain dormant or are abortive, and above these a fruiting branch is produced at each node. Under conditions of great luxuriance extra-axillary limbs occur at some of the lower nodes which would bear fruiting branches if the development of limbs was restricted. The length and number of vegetative branches largely determine whether the plants are bushy and spreading or upright. The control of the production of vegetative branches—that is, of the stature of the plant—is necessary because of the desirability of small plants in cultivation and harvesting.

Egyptian cotton when planted late apparently develops more numerous vegetative branches than when planted early. Early planting is therefore advisable as a means of restricting the development of vegetative branches.

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(1) See No. 497 B. March 1912.

Abortion of early fruiting branches on both axis and large limbs is common in a greater or less degree to all stocks grown from imported seed. Even the Arizona acclimatized plants frequently abort their lowest fruiting branches. Some of the selected acclimatized types of Egyptian cotton originated in the United States bear fruiting branches at lower nodes on the stem than the stocks of imported Egyptian cotton. Selection for low fruiting gives promise of being a practical means of increasing earliness and yield. Of the six Egyptian varieties grown in Arizona in 1909 from imported seed, Nubary most nearly resembled the acclimatized stocks in putting out fruiting branches at comparatively low nodes of the stem.

A method of recording branching habits of cotton by means of diagrams has been devised (Reference to the original publication is made for description of them). The diagrams show the location of branches, the development of fruiting branches, and the stature of plants. Such diagrams promise to be of value as records in the cultural and breeding study of cotton.

Preliminary experiments in « topping » young plants have resulted in stimulating the growth of buds in the axils of cotyledons. Branches just below the point where the plant is topped make an excessive vegetative growth and tend to assume an upright position in place of the severed axis. The topping of nearly mature plants to hasten the ripening of fruit has not yet been adequately tested.

Egyptian cotton plants grown on soil containing a considerable quantity of alkali restrict the development of limbs and reject their early fruiting branches.

Differences in the branching habits of the different Egyptian varieties grown from imported seed are not sharply defined, because of the diversity within each variety, and hence cannot at present be used to distinguish one variety from another.

SUGAR CROPS.

29 - Cultivation Experiments with Dried Seeds of Sugar-Beets in Hungary.

JANCSÓ, B. Anbauversuche mit vorgetrocknetem Zuckerrübensamen in Ungarn. — *Oester- Ungar. Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLI, Part 5, pp. 691-697. Wien, 1912.

Hastening the first developmental stage of the sugar-beet is now recommended as the best protective measure against the attack of root-rot, and to attain this end, different methods are adopted, such as husking, previous soaking of the seeds, manuring the rows, and finally, drying the seeds before sowing.

The last treatment is recommended by D. Hegy, Director of the Royal Hungarian Experiment Station for Vegetable Pathology and Physiology at Magyaróvár. The preliminary experiments in the laboratory showed that drying the beet-seeds had the effect of hastening the germination and the first developmental stage of the beets; therefore the Royal Hungarian Agricultural Experiment Station of Magyaróvar, together with the above-mentioned station, determined in 1911 to induce practical agriculturists to make experiments with dried seeds of sugar-beet. Two varieties of Kleinwanzleben from different sources were selected. The half of both varieties of seed was dried at 45°C. until the original water content was decreased from 14 or 15 per cent to 6 to 8 per cent. The other half of the seeds served as a control and was not treated before sowing.

The drying process improved the germination properties of both varieties; of 100 " seeds " 83 undried seeds germinated, giving 183 seedlings, while 87 dried seeds germinated, producing 213 seedlings. The second experiment: of 100 undried eeeds, 91 germinated with 220 seedlings, and of 100 dried seeds, 96 produced 275 seedlings.

The experiment with dried and undried seeds was carried out on 48 farms in Hungary in parallel strips each of at least about half an acre. The opinion of the experimenters was not unanimous. In 14 cases out of the 32 experiments on which reports were sent in, the effect of drying the seed was favourable, and only in one case did this treatment have an injurious action on the development of the plant. In the 17 other cases no special effect on germination was produced by drying the seed, not even where root-rot made its appearance.

The yield was ascertained on 30 of the separate experiment plots. The topped beets per acre were on an average as follows:

I. Undried seeds	264.9 cwt.
Dried »	272.1 »
II. Undried »	276.9 »
Dried »	283.3 »

The sugar content of the beets was tested, but there was no decided or consequent difference between the beets grown from dried or undried seed.

Although the above experiments, which only lasted for one year, give no decisive result as to the efficacy of drying beet-seed, they show that, under certain conditions, intensive drying of the seeds can have an accelerating effect on their germination and the development of the plants. In order to obtain still further light on the question, the experiments will be continued by the Experiment Station.

30 – A Contribution to the Question of Changes Occurring in Sugar Beets during Storage.

FRIEDL, GUSTAV. Ein Beitrag zur Frage der Veränderung der Zuckerrübe während der Aufbewahrung. — *Oesterreichish-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLI, Part 5, pp. 698-712. Wien, 1912.

Theoretical investigation has already often occupied itself with the question of the changes which sugar beets undergo in store. Most of the researches, however, dealt solely with the sugar, and the other substances were neglected; but it is just these dangerous producers of molasses, which play a large part in sugar-manufacture. In order to investigate this matter, in the autumn of 1910, sugar-beets were collected and stored in clamps on the experimental field of the Experiment Station of Magyaróvár in such a manner that weekly samples could be taken for the purposes of analysis.

The writer gives in tables the results of this experiment. Other tables give data relating chiefly to the weight, amount of sugar, and quotient, which have been supplied by Hungarian sugar-factories. Reference is also made in this paper to the works of Proskowetz, Marek, and Bruckner dealing with the decrease in sugar content during the storage period, and the writer gives the following summary of his own investigations:

It must be considered as an established fact, that the sugar content of beets decreases greatly during the time the latter are in the clamps.

A portion of this apparent relative decrease is due to the large amount of water which is taken up, causing the juice to become diluted.

The absolute, or real, sugar loss is brought about by the respiration processes of the living roots.

This loss can be avoided through interrupting the vital activities of the beets, which may be effected either by allowing them to freeze, or by drying them. These methods can naturally not be adopted by the manufacturer and recourse must be had to a different kind of clamp The sort to be preferred is one which with the least means will keep the roots at the lowest possible temperature. The loss of saccharose by means of respiration is caused by the formation of invertose as an intermediate product. The formation of the invert sugar is however a very lengthy process, but nevertheless, is more rapid than its consumption by respiration, thus in time it accumulates. The intensity of respiration depends entirely upon individual properties, but it is also influenced by external influences like temperature and the supply of air.

The stability of the nitrogenous compound is a great contrast to the instability of the saccharose. Until the late spring, the total nitrogen content suffers no absolute diminution. At the end of the storing time, the albuminous compounds alone split up into simples bodies. This fact has an unfavourable action on the ratio between sugar and molasses, and the quotient sinks.

The glutamin present seems chiefly to have increased, from which it may be deduced that beet albumen is rich in glutamic acid. The glutamin present in the autumn does not change into glutamic acid, though a similar alteration was stated by Scheibler to occur in the case of asparagin.

No noticeable difference was found in the autumn and spring betain content.

RUBBER, GUM AND RESIN PLANTS

31 - Rubber in Casamance, Senegal

ETESSE, Le Caoutchouc en Casamance, Senegal. — *L'Agriculture pratique des pays chauds*, Year 12, Nos. 114 and 115, pp. 231-238 and 310 and 315. Paris, Sept-Oct., 1912.

Casamance, which is a long strip of land bordered by Gambia on the north and Portuguese Guinea on the south, is especially rich in lianas and other rubber yielding plants. Rubber is one of the chief articles of export from Senegal, which country exported in 1910, 737 726 lbs. of this product, worth about £87,000. Senegal may be divided into two districts as regards rubber production : Senegal, properly so-called, *i. e.* the district between the river of that name and the frontier north of British Gambia, which produces and exports principally pea-nuts; and Casamance, where rubber is most produced and exported.

The exportation of rubber, which from 1895 to 1905 rose from 50 010 lbs. to 883 656 lbs., has decreased during the last few years, and the writer has set himself the task of investigating the possibilities of mantaining the present important position occupied by rubber in the trade of the country. To this end, he sets forth the present conditions of its production.

I. *Rubber from wild lianas.*

Although some small plantations of rubber trees exist, it may be said that all the rubber exported at the present time comes from the wild lianas, which grow in nearly all the forests of Casamance.

They belong to the genus *Landolphia* and the most common species is *Landolphia florida* which, however, is neglected by the natives on account of the inferior quality of its rubber. This plant is known to the Europeans under the name of « false rubber liana » and to the natives as « mad », « mantianpo », and « foufoufole ». The Casamance rubber is furnised by *Landolphia Heudelotii*, *L. senegalensis* and *L. tomentosa*; the latter seems to be preferred by the extractors, and is called « toll », « tolè ». or « torè ».

These lianas are not found now, as formerly, in all the forest. They have disappeared before the knife of the « manjacque » or rubber collector, and there remain only three large rubber districts, those of Bayotte, Balante and Fogny. Until lately, the natives extracted little rubber from them, but they were very particular, that no stranger should come and tap their trees and thus these stands have been preserved.

Collection of the latex. — The latex has only lately been collected by the natives of Casamance, and hitherto only by those of British Gambia and Portuguese Guinea, the « Akus » and the « Mandiasos » or « Manjacques ». The first are intelligent and careful; they usually tap the lianas and obtain, by means of coagulation with lemon juice, a very pure rubber, which is now little found in Casamance, « aku prima », known on the European markets, by the brand A. P. The second are careless, quarelsome and overbearing, they care nothing for the preservation of the lianas or for the production of first quality rubber, and the natives are obliged to defend themselves against these invaders and to proceed themselves to obtain the rubber. They tap the lianas by means of incisions, which are made too close together and, coagulate the latex at once by watering the incisions with salt water, with which they also wash the wounds made on the lianas. The rubber thus presents the appearance of large drops, or more or less elongated filaments, which the Manjacques roll into a ball. In the evening, they plunge this into water, or place it under ground; next day, it is taken out and fresh rubber added to it till it reaches the required weight. Then some rubber is rendered soft by means of putting it into boiling water and fashioning it into bands of some centimetres in width, which the native rolls round his ball and which give it the appearance of having been made entirely in this way. The ball is again plunged into water, where it remains until it is sold to the trader, who receives it dripping and still retaining its pink colour.

The aborigines adopt much the same method as the « Manjacques » and it is difficult to say which prepares the rubber best.

The cost price of tapping is calculated by reckoning that a man collects 26 to 33 lbs. of rubber per month, *i. e.* about 1 lb. per day. Experience has shown, that at the time when the liana is distended with sap, a Manjacque can without much difficulty obtain 2.2 lb. of rubber a day, but during the bad season he can only get 9 to 13 lb. per month.

Preservation of rubber and trade.

The rubber obtained is preserved in water or in the ground till the time of sale, which is thus deferred till the fall in price is over. Before accepting the rubber, the trader cuts the balls into two or four pieces to assure himself that they do not contain sand or earth. The purchaser puts the rubber once more into salt water, where it remains till it is exported, when the rubber is packed in casks while still damp. This method of preserving rubber is peculiar to Casamance and influences the price of the product; in Portuguese Guinea, on the contrary, it is kept dry after it has been smoked. Rubber kept always moist tends to become more sticky and to lose its resilience; sometimes it even putrefies.

Four trade marks are recognized in Casamance.

A. P. « Aku prima ».
A. « Aku ».
A. M. « Average Aku ».
B.

The A. P. quality has almost disappeared, and A. is now considered the best; after this comes A. M., which does not contain earth, and B. which, besides various other impurities, contains also sand and even mud. In any case, it appears that A. alone is absolutely free from earth, so much so, that firms which furnish this quality are exempt from the risk of fluctuations in the market and can always sell it under the most advantageous conditions; while the qualities. A. M. and B. are often neglected when prices fall.

II. *Plantation rubber.*

Rubber from the plantations is always preferred in international trade; it is natural therefore, that, in addition to the measures which have been suggested to encourage the production and facilitate the exportation of quality A., the question of planting rubber trees should also have been considered.

In 1895, a nursery of Ceara (*Manihot Glaziovii*) was made at Sedhion and, in view of the threatened disappearance of rubber lianas, it was contemplated using Ceara, as a certain number of seeds and of plants existed on the spot.

Ceara.

These trees multiply very rapidly, but unfortunately their prolificness is counterbalanced by the injury caused by the forest fires due to the carelessness of the natives. The Ceara must be some years old before it can resist fires, so that the species seldom passes the limits of the forests.

Few reliable data exist as to the best age for tapping and on the yield of rubber, as well as regarding the best system of operation. It seems, that an adult tree gives from 8 ½ to 10oz. of rubber per tapping and in the dry season between January and June, a collector does not obtain above 8 ½oz. a day. In these districts, the Ceara comes into leaf in July, and the tapping done from July to January would be more lucrative than that undertaken during the dry season when the incisions cicatrise badly, owing to the hot east winds, and sometimes bring about the death of the tree. Thus the winter tapping is best.

The operation should be carried out by means of horizontal or vertical incisions, but fish-bone or V shaped cuts must be avoided, as they are injurious to the tree.

Other rubber trees.

The Ceara is not the only rubber tree which thrives in Casamance. Experiments made at Martinique with *Funtumia* seem to show that this tree also could be advantageously grown; it is very hardy and would resist the scorching winds well, its bark being less delicate than that of Ceara; further, its general appearance and greater supply of latex are also advantages over the latter tree. The observations made at the Agricultural Station of Mangacunda seem to confirm these views.

Funtumia and Ceara are trees suitable to averagely damp districts; but in plantations of some extent, inequalities of the ground are to be met with, where during the winter rains actual swamps occur; in these *Ficus elastica* can be planted with advantage. As for *Hevea brasiliensis* and *Castilloa*, it can only be said that the experiments made at Mangacunda do not appear to be conclusive.

VARIOUS CROPS

32 - Instructions for Experimental Tobacco Growing.

FILIP. Essai de culture de Tabacs. — *L'Agriculture pratique des Pays Chauds*, 12th Year, No. 115, pp. 327-330. Paris, October 1912

In order to assist all those who desire to try cultivating tobacco in the colonies, the Colonial Garden of Paris has asked for and obtained a series of instructions, drawn up by the International Commission of Colonial Tobaccos, of which the following is a summary:

Conditions for the production of light Tobaccos.

a) *Selection of varieties.* Those varieties that in their country of origin possess a low nicotine content.

b) *Soil.* Light permeable soils without permanent moisture are to be preferred.

c) *Manures.* Nitrogenous manures stimulate greater development of the leaves, greater thickness of the tissues and higher nicotine content. Potash on the contrary produces finer and more pliable tissues.

d) *Density of Plantation.* The nicotine content is lower the closer the plants are to each other. The weight of the crop increases with close planting. Experiments made at the Colonial Garden in 1911 have shown that the weight of the crop increased by 60 per cent when 17 000 plants were grown on an acre instead of 8 500. For the production of light tobaccos it is therefore profitable to increase the number of plants per acre.

e) *Number of leaves.* The nicotine content is in inverse ratio to the number of leaves, while the weight of the crop is in direct ratio, reaching a maximum between 15 to 20 leaves.

Conditions for the production of combustible tobaccos.

The variety is to be determinrd by trials of the combustibility of the leaves, and the soil that is selected must have sufficient assimilable potash; if it should be deficient in potash, this element must be added. For the reasons given above, if a heavy crop of tobacco with low nicotine content is desired, it will be necessary to ascertain by experiments with each variety which are the optimum conditions of closeness of planting and of number of leaves, on the plan given below:

	Distance between the plants	Plot No.	No. of leaves per plants
The same variety	24 × 32 inches = 8 500 per acre	1	10
		2	15
		3	20
	24 × 20 » = 13 300 per acre	4	10
		5	15
		6	20
	20 × 16 » = 20 200 per acre	7	10
		8	15
		9	20

These figures hold good for Maryland, Burley, light Kentucky and other fine leaved varieties, Sumatra, Java, etc.

Conditions for the production of Nicotine Tobaccos.

According to experiments conducted in France it appears that the maximum of nicotine for a given area is obtained under the following conditions:

1. Leaving 6 or 7 leaves per plant.
2. Setting the plants at such a distance as to cover the soil without the leaves injuring each other. With the Lot variety this has been obtained by 8 100 plants per acre, with Sufi 12 100 per acre. The density of the plantation varies with the vigour of the plant, the climate and the soil. Experiments may therefore be made on the following plan:

Plants per acre	Plot No.	No. of leaves per plant
4 050	1	5
	2	7
	3	10
8 100	4	5
	5	7
	6	10
12 150	7	5
	8	7
	9	10
24 300	10	5
	11	7
	12	16

The subsequent cultivation is the same as for the fine tobaccos, only the pinching off of the side shoots requires special care.

33 – The Coffee Plant in Arabia.

PILLON, J. Le Caféier en Arabie. — *Agriculture pratique des Pays Chauds*, Year 12, No. 115, pp. 331-333. Paris, Oct. 1912.

The type-species *Coffea arabica* is the origin of four varieties, which have very different and transmissible characters and are all cultivated in the Yemen. These are:

1. "*Matari*," a plant with very small berries, which is cultivated between the towns of Menakha and Souk-el-Khemis, at an altitude of about 2 000 feet; this is the most renowned of the Arabian species of coffee.
2. "*Haini*." This much resembles the latter, but has larger berries.
3. The "*Kérési*" and "*Cohlaru*" varieties yield very good berries, but their quality is inferior to that of those borne by "*Matari*."

The Yemen includes two very different districts, both as regards the nature of the soil and the climate. From the shores of the Red Sea to the mountains of Central Arabia there extends a vast sandy desert belt about 62 miles wide, called the "Theama," consisting of recent alluvium, which surrounds the second district. This has a warm-temperate climate and is remarkably productive. The temperature here varies from 14 to 26°C. in the day and drops to 22°C. at night during the summer. In winter, the thermometer drops to —1 and —2°C. at night, and rises in the day to 29°C., a higher temperature than it reaches in summer. The irregular rainfall amounts annually to from 800 to 2 000 mm. (32 to 80 inches). In this district, coffee plants are cultivated on terraces, which extend in steps from the base of the valleys to the highest summits. The natives have used all the primitive means at their disposal to retain the water and supply the soil necessary for the plants. The areas of these terraces necessarily vary according to the height at which they are made; the largest may be from $^1/_8$ to $^1/_7$ of an acre; there is about one coffee plant per square yard. The coffee plants are cultivated at between 4 000 and 6 600 ft., in large and deep ravines sheltered from the wind. These clefts are a characteristic of the geological formation of the mountains.

The coffee plants are given no manure; sometimes, when it is possible, the native irrigates the plantation, but more usually, he digs basins around each stem; these are united by a channel, in order to utilise and equally distribute the rainwater. The coffee plant is never pruned; the native merely ploughs the entire terrace before the awakening of vegetation and replaces the soil when the rain washes it away. The bad state of the plantations and the little care given to them cause the crop to be much inferior to that which could be obtained by systematic cultivation. The harvest takes place in December, and after a short preparation the coffee is transported on camels to Hodéidah, or to Aden, where Europeans prepare it for exportation to Europe. A shrub called "Gath" is sometimes cultivated together with the coffee plant; the young leaves of the former are used for chewing and contain small glands, which secrete a sugary liquid with excellent properties due to the presence of an alkaloid, which is probably analogous to cocaine.

FRUIT-GROWING.

34 – A Table Summarizing the Properties of the Different Vine Stocks of adapting themselves to Different Soils.

BURNET, J. Tableau résumant les facultés d'adaptation des differents porte-greffes aux differents terrains. — *La Petite Revue Agricole et Horticole*, Year 18, No. 430, p. 247. Antibes, November 10, 1907.

Nature of the Soil.	*Suitable varieties.*
Non-calcareous soils, provided they are not too dry, or shallow, or too damp, limit of lime 20 per cent, rather light, or semi-light.	Riparia Gloire de Montpellier.
The same soils, but dry, though not exclusively so, limit of lime 15 to 20 per cent.	Rupestris × Cordifolia 107-11. Cordifolia × Riparia 125-1.
The same soils, not excessively dry, lime limit 20 per cent.	Riparia Grand Glabre, Rupestris × hybride Azémar 215-2, Aestivalis × Riparia 199-16.

Nature of the soil.	*Suitable varieties.*
Same soils, not excessively dry, lime limit up to 25 per cent.	Riparia × Rupestris 11 F, Riparia × (Cordifolia × Rupestris) 106-8.
Same soils, not excessively dry, lime limit 25 to 30 per cent.	Riparia × Rupestris 101-14. Rupestris × Riparia 75-1. Rupestris × Riparia 108-103. (Cinerea × Rupestris de Grasset) × Riparia 230-6-20. Riparia × Rupestris 101-16.
The same soils, not excessively dry, lime limit 30 to 40 per cent.	Riparia du Colorado.
Ground with stones and soil mixed, provided they answer to the following conditions.	
Soils apparently dry but deep, being neither damp nor dry, especially as regards the sub-soil. Having good warm exposures-slopes.	*If they have not more than 20 to 25 per cent. of lime.* Rupestris Martin, Rupestris du Lot. *With 30 to 40 per cent. of lime.* Rupestris du Lot. Berlandieri × Riparia 420 A. Berlandieri × Riparia 420 B. Chasselas × Berlandieri 41 B.
Heavy soils, which cake, argillaceous, containing on analysis a large proportion of fine sand (which occurs in the case of many soils of glacial clay). Lime 20 per cent.	Riparia. Riparia × (Cordifolia × Rupestris de Grasset) 1068. The last may be tried up to 25 per cent.
Lime 25 per cent.	Riparia × Rupestris 101-14. Riparia × Rupestris 101-16.
Lime 25-35 per cent.	Riparia × Rupestris 3309-3306.
Lime 40 per cent.	Aramon × Rupestris, Ganzin No. 1.
Lime 45-55 per cent.	Mourvèdre × Rupestris 1202. Berlandieri × Riparia 157-11. Berlandieri × Riparia 420 A. Berlandieri × Riparia 420 B.
Soils containing more than 55 per cent. of lime, provided that there is no stagnant moisture in the sub-soil.	Chasselas × Berlandieri 41 B.
Soils compact, or not, with 25 to 30 per cent. of lime, very damp.	Solonis × Riparia 1616.
Soils very dry to great depths, non-calcareous.	Riparia × (Cordifolia × Rupestris) 1068. Cordifolia × Rupestris 107-11. Cordifolia × Riparia 125.
Soils very dry to great depths; calcareous.	Bourisquon × Rupestris 603. Cabernet × Rupestris 33A. Monticola × Riparia 554-5.

For some stocks which have not yet been tried in France from the point of view of chlorosis, viz. Riparia × (Cordifolia Rupestris) 1068 etc., the writer fixes a lime resistance limit according to the vine-growing literature of other districts.

35 - The Vineyards of the Côte-d'Or (France).

PACOTTET, P.: Les Vignobles de la Côte d'Or. - *La Vie Agricole et Rurale*, No. 47, pp. 562-565. Paris, October 1912.

The department of Côte-d'Or contains the most celebrated vineyards of Burgundy, which produce the finest red and white wines of the world.

The vineyards are divided into four districts: Beaune, 39 500 acres; Dijon, 17 300 acres; Semur, 5 000 acres; Châtillon, 2 500 acres; *i. e.* 64 300 acres of entirely reconstituted vineyards. They form several regions: la Côte, l'Arrière-Côte, Val-de Saône, l'Auxois and le Chatillonnais. Val-de-Saône consists of marly slopes, which overlook the bed of the Saône. With the Melon grape, on the slopes of Ecuelles, Chivres, and Labergement, very good ordinary white wine is produced for drinking when new.

Arrière-Côte is composed of coombes and gullies separating the hills, which form the immediate and highest background of the slopes of la Côte. The latter, l'Auxois and le Chatillonais, districts lying further in the mountains of the Côte-d'Or, produce quantities of red wines from the Gamay grapes and their varieties, the highly coloured Gamays.

Parallel to the Saône at a distance of 12 miles from the river and separated from it by a plain covered with cereals and forests, the portion of la Côte containing the vineyards that produce the finest wines forms an almost straight continuous line of slopes between Dijon and Chagny. These vineyards form a belt from a third of a mile to a mile and a quarter in width which rises to about half way up the slopes (an altitude of from 725 to 900 ft). where they join waste, dry, stony land forming the summits of the hills. The soil is always more than 20 inches deep and is composed of very red vegetable soil, chiefly marl, full of small stones.

In les Romanées, on account of the frequent additions of decalcified soil from the plateaux, which have been repeated for centuries, the vegetable soil reaches a depth of from 5 to 6½ ft. Often two or three supporting walls on the slopes serve as roads and form two or three terraces to keep up the soil.

The subsoil consists of three important stages of the Jurassic: Bajocian, Bathonian and Oxfordian, overlain at times, as at Beaune, with a thick stratum of Rauracien (1) with a corallian facies.

The Côte de Gevrey-Chambertin is on the Bajocian, a hard crystalline limes tone. Côte de Nuits is situated on the Bathonian, a fine, hard limestone, while the Oxfordian dominates on the Côte de Beaune, where it has a pseudo-lithographic limestone, or a marly facies. These different geological stages, though all represented by limestones, impart very distinct characteristics to the wines.

Those from the Côte de Beaune, where the lime content of the soil is increased by the marl, are very fine in quality, have much bouquet, and are also very delicate, but they do not keep so long as the more full-bodied wines of Côte de Nuits with their larger amount of bouquet. The wines of Cote de Gervey-Chambertin are a little deeper in colour and have more body than the former.

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(1) A name proposed by Greppin for the "Corallian". (*Ed.*)

All the soils which produce wine of the best quality are deep, the subsoil is always damp and their good chemical composition is shown by the following analysis.

Analysis of the soil of the principal vineyards of Côte d'Or.

Amount of substances determined per thousand parts by weight	Chambertin	Clos-Vougeot	La Romanée	Les Saint-Georges	Bressandes, Beaune	Montrachet
Gravel	104	—	270	167	320	104
Small stones	216	—		253		220
Fine soil	680	—	730	580	680	676
Analysis of fine soil :						
Silica	450	598	500	634	307	337
Clay	460	272	349	102	235	281
Calcium compounds	48	110	59.4	122	318	316
Humus	23	—	—	18.8	—	24.9
Nitrogen	1.68	1.67	—	1.79	—	1.47
Phosphoric acid	2.19	2.68	—	2.14	—	1.93
Potash	3.06	2.81	—	3.87	—	5.20
Magnesia	1.53	4.03	—	1.10	—	traces
Sulphuric acid	traces	—	—	0.08	—	—

Pinot noir, with its colour varieties ranging from " Pinot gris " or " beurot," to " Pinot noir " and its numerous varieties, are the only vines in the large vineyards producing red wine in the Côte d'Or. Formerly from $^1/_{15}$ to $^1/_{20}$ of Pinot blanc Chardonnay was added. The latter is the sole variety cultivated for the production of the famous white wines of Montrachet, and Meursault. In the latter, as it was not very productive, the Aligoté variety was associated with it; this produces excellent wines on the stony or marly summits of la Côte. On the plain, at the foot of the slopes, Gamay varieties give strong, coloured wines, which are rather harsh. This variety is associated in some vineyards with Pinot, or its grapes are mixed in the vat with those of the latter ; the resulting wines are excellent and are known under the name of " Passe-tout-grains." The red and white Pinot wines are classed under the heads of " tête de cuvée ", " première cuvée," "deuxième cuvée," "troisième cuvée," after which come the "passe-tout-grains," "grands ordinaires," "ordinaires". The two last are Gamay wines.

The vineyard of la Côte is divided into three districts: 1) Côte de Dijon; 2) Côte de Nuits; 3) Côte de Beaune. The Côte de Dijon has no first class vintages. But on the other hand, at Chenôve, Fixin, and Brochon excellent "Passe-tout grains" is made. The Côte de Nuits, of which the Côte de Gevrey-Chambertin is a subdivision, produces the following wines: *a*) at Gevrey-Chambertin: Chambertin and Clos de Bèze (tête de cuvée); *b*) at Morey: Clos de Tart (tête de cuvée); *c*) at Chambolle-Musigny: Musigny (tête de cuvée) the wine of finest quality in all Côte d'Or; *d*) at Vougeot: Clos Vougeot (tête de cuvée); *e*) at Fageay-Echézeaux: Echezeaux (tête de cuvée): *f*) at Vosne-Romanée: Romanée Conti, the most excellent of all the red wines; Romanée, Romanée Saint Vivant, Tâches, Richebourg, all "tête du cuvée"; *g*) at Nuits-Saint-Georges: Saint-Georges, Cailles, Vaucrains, "tête du cuvée."

Besides the great red wines, the Côte de Beaune produces also first class white wines wherever the calcareous marls of the Oxfordian predominate. These include *a*) at Pernaud: Charlemagnes, white and red, the Vergelesse varieties, "tête de cuvée;" *b*) at Aloxe-Corton: the Corton and Charlemagne varieties (tête de cuvée); *c*) at Savigny-les-Beaune: Vergelesses (tête de cuvée); *d*) at Beaune: Grèves; *e*) at Pommard; the Rugier varieties, ("haut et bas," "tête de cuvée"); *e*) at Volnay: En Cailleret (tête de cuvée); *f*) at Meursault: Perrier, Charmes, Genevrières and Gouttes d'Or are all white wines of the "première cuvée;" *g*) at Puligny-Montrachet: Montrachet ainé (tête de cuvée) is grown entirely on the salmon-pink marls of the lower Bathonian; above this, halfway up the slope, Chevalier Montrachet is cultivated in a poor red soil with a stony subsoil, while below it Bâtard Montrachet grows in a deeper, richer soil; further down nearer the plain, it yields remarkable wines "de première cuvée;" *h*) at Chassagné-Montrachet: Clos Saint-Jean (tête de cuvée); *i*) Santenay: Gravières.

The vines were formerly planted thickly, 8 000 or 10 000 stocks per acre; they are now arranged in lines and do not contain more than about 4 000 vines per acre. Layering the vines tends to decrease.

The addition of new soil is now rarely practised, as the system has become too costly, but the vines are given stable-manure, or chemical fertilizers, which was formerly avoided.

The vines are pruned to low stocks with three or four branches; leaving the canes longer, which suits the Pinot variety well, is not practised, as it diminishes the quality of the fruit, though it considerably increases the quantity.

Only a few proprietors pick over their grapes, which are as a rule sound. The wine is fermented in open vats of small volume, 440 to 1760 gallons, after which it is placed in new oak casks, in which it is sold, after having been kept two, three and four years.

36 - Viticulture in the Department of Concordia (Entre Rios, Argentina).

ANZORENA, PEDRO. La Viticultura en el Departamento de Concordia. — *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 7, pp. 621-636. Buenos Ayres, 1912.

From its geographical situation, the department of Concordia is included in the zone of vine cultivation, but the physico-chemical nature of the soil renders this industry unremunerative at present. Nearly all the vineyards are to be found in the neighbourhood of the town of Concordia and for 8 or 10 years they have not been extended, although the undulating and hilly configuration of the district is very suited to vine cultivation. The soil, which is entirely siliceous, attains a depth occasionally of 1 metre (3 ft. 3 in.) and rests upon a clayey or loamy sub-soil, generally of an impermeable character; sometimes the soil and the subsoil are alike in composition.

There is a scarcity of lime, phosphoric acid, and especially of nitrogen in the soil and the vine consequently grows badly and bears little fruit; further, the humidity of the subsoil is very conducive to the development of fungoid diseases, which have all been observed in the vineyards. Thus, it is advisable to alter the physical and chemical properties of the soil by means of drainage and the addition of lime, as well as of organic and mineral fertilizers. On soil thus prepared, hoed crops, or leguminosae must be grown for two or thee years; planting should be regular and the system of cultivating and of pruning which is chosen should be adapted to the soil, the climate, and the vines.

Green pruning is advisable as it always tends to ensure a better and larger crop; the weeds should be carefully removed and the soil kept sufficiently damp, but not excessively humid, as it is at present.

So far, only one variety of vine is known in the district viz. "Lorda," which resembles Malbeck and Tannat. This is grown on its own stock, but the practice of grafting on American vines is becoming increasingly common. The Lorda variety is very resistant to fungus diseases, but bears few grapes, so that it would be well to replace it by kinds which would adapt themselves to the climate and soil.

It appears, that preference should be given to white table wines and to red wines for blending. The former could very well be used in the preparation of imitations of Marsala, Port, Sherry, Malaga, etc.

The stocks which are most recommended for the Department of Concordia are the following: Riparia Gloire de Montpellier, Riparia Grand Glabre, Rupestris Monticola, Rupestris du Lot, Riparia Rupestris.

As regards the wine making, the writer states that it is done under the best conditions and according to modern methods.

Sr. Anzorena advocates the creation of experimental nurseries, vineyards and cellars.

37 - Report on Fruit Culture in the School of Practical Agriculture at Wagnonville.

PINELLE, M. Rapport sur les cultures fruitières de l'Ecole Pratique d'Agriculture de Wagnonville. — *Journal de la Société Nationale d'Horticulture de France*, Fourth Series Vol. XIII, pp. 656-659. Paris, October, 1911.

The following report was drawn up by the writer subsequently to the visit paid by the members of the commission of the National Horticultural Society of France for the purpose of examining on the spot the pruning operations carried out upon fruit trees and especially pear-trees, by M. Lorette, Cultivation Director at the School of Wagnonville (Nord).

The soil of the school gardens is clayey or loamy to a depth of 20 to 23 ft.; the arable stratum has been much inproved to a depth of 16 to 20 inches. The trees are vigorous and receive a liberal annual dressing of manure. All the pear-trees are grafted on quinces.

The shapes used are, in the open, the winged pyramid (with four wings) which is much recommended by M. Lorette as affording the trees most light; the classic shapes are also employed: U and double U, Verrier's palm-leaf, etc.

The pruning methods adopted by M. Lorette, and which have lately attracted much attention, do not completely revolutionize the pruning principles of the so called " three bud " system; but the latter have been greatly modified by him, the most important changes being the accelerated bearing of fruit on suckers and on vigorous fruit branches.

The following is a summary of M. Lorette's methods of pruning.

Leading branches. The leaders of trees in course of being trained are not pruned except when necessary to obtain the different stages or for removing the portion of the branch, which is not sufficiently lignified; this is done during May when vegetative growth is already active and the shoots are an inch or more in length; in cases where the terminal bud has become a flower bud it has nevertheless to be removed.

In the winged pyramid, the first stage is made by one pruning, the branches thus obtained are not shortened, but are placed in the horizontal position and then bent up; they continue to grow up to the top of the tree. The branches of the successive stages are obtained by cutting them back at a distance of 20 inches from the preceding stage, training the branches thus obtained horizontally and bending them up for a length of 8 to 12 inches against the branch coming from below.

For the prolonging of the stem the least vigorous branch should be selected; nearly always the buds growing from the dormant buds are chosen. It is necessary during the vegetation period to free the prolongations of the leaders from all the false buds which are likely to develop, by cutting the latter at a few millimetres from their base.

If there is a want of equilibrium between the various prolongations, this must be restored by removing a third, or a half, of the blade of the leaves growing on too vigorous branches.

In the case of trees which are completely trained, the branches which prolong the leaders are left intact during the vegetative period and throughout the winter. After the sap awakens, in May, they are removed at their base. Choose amongst the numerous secondary buds one which seems the weakest, keep this intact and remove the others; this operation should be repeated every year.

The object of not pruning the leading branches on trees in process of training, is to obtain weak fruit branches, sometimes even only fruit buds; nevertheless fruit branchlets may develop.

Fruits. — Towards the 15th of June, the fruit branchlets of from 10 to 12 inches in length are treated as follows :

1. Those which have attained a thickness of 7 to 8 millimetres and more, are cut back at 8 to 10 millimetres from their point of insertion ; one or more stipular buds develop which can become spurs, or new fruit branchlets.

2. The fruit branchlets which have not attained to the abovementioned thickness, are cut to 3 eyes ; one or two false buds may develop, which are cut back to 8 to 10 mm. if these are new fruit branchlets ; often they are spurs, in which case they are left intact.

3. The fruit branchlets which develop on the cluster spurs should be cut back to some millimetres in length. On the 15th of July, the second green pruning is done; this consists as before in cutting back to 8 to 10 mm. the fruit branchlets derived from false buds, or stipular buds, and which are 7 to 8 mm. thick. Cut back the weakest to three eyes, or pierce them through with a grafting knife between the 3rd and the 4th leaf.

It would be natural to suppose that the suppression of these buds would cause the spurs to develop into fruit-branchlets and cause a serious perturbation on the growth of the tree. The Commission examined a pear-tree Doyenné d'Alençon from which over 400 buds had been removed on July 15 (second pruning), and found onlv a few shoots, although the tree was vigorous.

On August 15, a new operation is carried out according to the same system ; in September the shoots on the spurs are cut back and also those on the fruit buds, which latter are thus able to profit by all the available sap. In winter the supernumerary fruit buds should be removed.

By this pruning method M. Lorette considers that he obtains more fruit buds than by the ordinary system; the resulting buds are stronger, and contain 17 or even 20 flowers ; in the event of frost, the flowers in the centre of the inflorescence protect those of the periphery which are placed below them. Further, this method of pruning requires less time.

The members of the Commission were unanimous in declaring that the trees were very vigorous and were regularly covered with fruit branches from top to bottom, the latter being more numerous and shorter than is usually the case ; the number of leaves was consequently larger. Even on the horizontal portions of the branches, above and below alike, fruit or fruit buds were found; no part was bare.

With regard to counter espaliers and non-espaliered forms, the yield was very large and the trees were healthy. The results appeared less satisfactory on espaliers, which bore little fruit.

As M. Lorette himself explained, too many fruits had been left on this year.

The members of the Commission themselves counted: 156 fruits of almost normal size on 7 feet of the branches of Beurré Sterckmans, *i. e.* about 22 to the foot; on 3 ft. 3 in. of P. Doyenné du Comice, 21 fruits weighing about 100 grammes on August 22; on 3 ft. 3 in. of P. le Lectier, 17 fruits were obtained.

To sum up: the Lorette method of pruning seems to give good results, especially in the case of trees in the open; it is more adapted to pear-trees than to apple-trees, and is especially advantageous where the trees are very vigorous; a liberal supply of manure should be given at the same time.

It would be premature to say that the above-mentioned operations are always successful, for all shapes, in all climates, on every soil and with any exposure; it is necessary to experiment, and after some years, when the examples are more numerous, it will be possible to form a definite opinion on the subject.

38 – Is it Necessary to Fertilize an Apple Orchard?

HEDRICK, U. P.: *Thirtieth Annual Report of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1911*, Bulletin No. 339, pp. 262-304 + figs. 5-11 + plates XVII-XX. Albany, 1912.

ID.: A Comparison of tillage and sod mulch in an apple orchard. *Twenty-eighth Annual Report of the Board of Control of the New York Agricultural Experiment Station (Geneva, Ontario County) For the year 1909*, pp. 435-490 + plates XXV-XXXI. Albany, 1910.

ID.: Orchard Management. *Ib.* pp. 526-537.

New York Agricultural Experiment Station, Bulletin No. 289.

A problem which remains to be solved is that of fertilizing apple orchards. The current recommendations for fertilizers in orchards are of little value, for few experiments have been made which have furnished accurate data. The methods usually practised are almost exclusively based upon fertilizing field and garden crops, but the requirements of the apple-tree cannot be compared to those of herbaceous plants owing to the great difference in the habits of growth of the two kinds of plants. Fertilizing apple trees is also a difficult question, for besides there being variability of plants and environment to contend with, it is necessary to consider the tree and the future crop.

Four Experiments at New York Agricultural Experiment Station.

With the hope of throwing some light on orchard fertilization, the New York Agricultural Experiment Station has undertaken several experiments. In one of these, the effects of potash, acid phosphate and lime were tested; the second was combined with a test of tillage and sod-mulch; the third is now under progress in a continuation of the orchard management test just mentioned; in the fourth, the fertilization of orchards which are not in sod is studied. This last experiment is of double importance. In the first place, it is the only experiment which has been carried on for a sufficiently long period *viz.* 15 years. Further, as the disturbing influence of the grass has been eliminated, the effect of the fertilizer on the apple trees will be more decisive.

The site and soil of the experiments.

The experiments in question were carried out in an orchard where the soil was a heavy clay loam and had been used for the ordinary rotation of farm crops.

There were 12 plots, each containing 5 trees and separated by single rows of trees not in the experiment. There were four fertilizer plots in duplicate in the experiment and four check plots; the latter were reduced to three.

The fertilizers used were as follows:

Stable manure	plots 1 and 9; average per year	415.15 lbs. per tree
Acid phosphate	" 2 " 8 " " "	12.66 " " "
Muriate of potash	" 6 " 10 " " "	7.26 " " "
Acid phosphate		12.6 " " "
Muriate of potash	" 4 " 11 " " "	7.26 " " "
Acid phosphate		12.6 " " "
Nitrate of soda		3.67 " " "
Dried blood		12.84 " " "

It is noticeable, that since the fertilizers were put on only underneath the branches of the trees, a tremendous excess of each was used. This experiment should therefore show whether excessive fertilization is deleterious to trees or not. The trees used were Rome, top-worked on Ben Davis, the Rome buds all having come from one tree, and the stocks were carefully selected in order to obtain an orchard as free from individual variation as possible. The trees in the orchard were amply cross-pollinated.

Results of the experiments.

In gaging the value of the different fertilizers, it is necessary to consider the crop, size, colour, flavour, time of maturity, texture of flesh and the keeping quality of the fruit, and also the diameter of the tree, the colour and weight of the foliage and the length and weight of the annual growth of the branches. It may be said that the experiments did not prove the truth of the current opinion of the effect of fertilizers on apple trees: the yield does not seem to have been larger; on the other hand, the size of the fruit had a tendency to increase, while the percentage of culls was a little higher on the check plots. In any case, the colour, flavour, and keeping qualities were not influenced by the fertilizers. The measurements of the diameters of the tree trunks only showed differences due to ordinary causes of variation.

The most noticeable effects were obtained by the application of nitrogenous manures; the leaves were greener and also weighed more and the annual growth of the branches was increased.

Analysis of the soil also showed that the upper twelve inches of the soil at the beginning of this experiment contained sufficient nitrogen to last apple trees bearing twenty bushels of fruit per tree 183 years and enough phosphoric acid and potash to supply them for 295 and 713 years respectively. Thus as the experiments have shown, with these large reserves all that is necessary is yearly ploughing and thorough cultivation, together with the ploughing under of cover crops.

Commercial fertilizers are therefore little needed, except on sandy and gravelly soils deficient in potash or phosphates and subject to drought, or those of such shallowness or mechanical texture as to limit the root-range of apple trees, or which are too wet, too dry, or deficient in humus. Some apple orchards may require two of the elements, but few should need a complete fertilizer.

A fruit-grower may assume at once if his trees are vigorous, bearing well and making a fair amount of new wood, that they require no fertilizer. If the trees are not in this condition, attention should be paid first to drainage, tillage and the health of the trees, before having recourse to the use of fertilizers. Before applying the latter on a large scale, it is necessary to carry out a fertilizer experiment.

Plan for a Fruit Grower's Fertilizer Experiment.

The fruit grower may determine by a plan adapted from this experiment, what fertilizers his orchard needs. The trees selected should be of the same variety and age, and the soil as uniform in texture and fertility as is possible. There should be a sufficient number of trees in each plot to offset individuality in the former; five is the minimum number that can be used with any degree of accuracy.

On plot 1, use stable manure to supply 50 lbs. of nitrogen to the acre per year. This, on the average, would be about 5½ tons per acre. In an orchard where the trees stand 40 ft. apart, use about 400 lbs. per tree.

On plot 2 use a phosphate fertilizer in sufficient amount to supply 50 lbs. of phosphoric acid per acre per year. A good recommendation is 360 lbs. of 14 per cent. guaranteed acid phosphate per acre, or 13 lbs. of fertilizer per tree.

On plot 3 apply muriate of potash guaranteed 48 to 52 per cent actual potash. Apply 100 lbs. of potash per acre, which would require 200 lbs. of muriate of potash per acre, or 8 lbs. per tree. Combine with the potash the acid phosphate in the amounts prescribed for plot 2.

On plot 4 use a complete fertilizer consisting of nitrogen as applied in plot 1 and of phosphoric acid and potash as applied on plot 3. Or for the stable manure substitute 350 lbs. per acre (13 lbs. per tree) of dried blood with 9-12 per cent of nitrogen, or 100 lbs. per acre (3 $^2/_3$ lbs. per tree) of nitrate of soda. Plot 5 should be a check.

If it is thought desirable to test the influence of lime, duplicate plot 4 with the addition of 25 lbs. of slaked stone lime per tree.

All things considered, the best time to apply fertilizers is the spring, as soon as the ground can be worked. Spread broadcast about the tree over an area slightly larger than that covered by the branches. In cultivated orchards the commercial fertilizer should be harrowed in and the manure ploughed under. If the results are to be at all conclusive, such an experiment should last for several years. The crop should be weighed or measured at harvest time to determine the relative value of the different treatments.

It is not sufficient to keep count of the marketable fruit from each plot; culls and windfalls should be accounted for.

All plans and preparations for such experimentation can be made in the winter, so that the actual work in the spring need not be great.

39 - Promising New Fruits.

TAYLOR, U. A. and GOULD, H. P. in *Yearbook of Agriculture for* 1911, pp. 423-438. Washington, 1912.

The following new fruits are described at length, as they are believed to possess a value in the future development of fruit culture, but the Department of Agriculture has no stock of these varieties available for distribution.

1. *Cornell Apple.* — grown by T. O. Duvall, Burstonville, Montgomery Co., Md.
2. *San Jacinto Apple* -- grown by Dr. A. M. Ragland, Pilot Point, Denton Co., Tex.
3. *Shiawassee Apple* — grown by H. C., & M. D. Ward, Pontiac, Oakland Co., Mich.
4. *Ayer Pear* — grown by O. H. Ayer, Sibby, Douglas Co., Kans.
5. *Russel Peach* — grown by F. O. Harrington, Williamsburg, Iowa Co., Iowa.
6. *Laire Plum* — grown by E. Bartholomew, Stockton, Rooks Co., Kans.
7. *Montcelt Plum* — grown by R. Bates, Jackson, Aiken Co. S. C.
8. *Panarity Grape* — grown at the Cooperative Experiment Vineyard, Fresno Co., Fresno, Cal.
9. *Thomson Orange* -- grown at Riverside, Cal.

40 - Remarks on the Coco Palm.

MAIN, F. Considérations sur le Cocotier. — *Journal d'Agriculture Tropicale*, Year 12, No. 136, pp. 292-298. Paris, Oct. 30, 1912.

In referring to the two works of H. Hamel Smith and of W. Barrett, which draw attention to the economic value of plantations of Coco palms, the writer gives a rapid review of the most recent publications dealing with the cultivation of these trees. (1) He especially examines the disputed questions (for though the cultivation of the coco-palm is a task of extreme simplicity, the different writers are, nevertheless, not of one mind on this subject), and attempts to show the conclusions to which experts are inclining and to specify the figures which are gradually being accepted.

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(1) Abstracts of a number of articles on the economic importance and the technical problems of this cultivation have appeared in this *Bulletin*: see, amongst others, Nos. 2690, 2691 and 2692 of *B* Aug.-Sept.-Oct. 1911, and No. 1910. *B*, Sept. 1912. The last summarizes the most recent researches on the subject. (*Ed.*).

Growth of the Coco Palm. — It has often been stated that this tree cannot grow at any distance from the sea, but it has now been proved that it thrives as far as 300 km. (186 miles) inland. The neighbourhood of the sea is, nevertheless, beneficial to this palm, and in the Philippines, for instance, the coast is almost uniformly bordered by stands of coco-trees. On the other hand, the excessive transpiration of the leaves, which in the case of a tree in full growth, can amount to 45 litres (10 gals.) per day, necessitates a climate of sufficient humidity to compensate for the large amount of water lost by this means.

Making a plantation. — After comparing the different estimates and schemes published by various writers, and making allowance for the fact, that during the first 7 years only expense can be looked for, M. Main concludes,that the expense of an area of 2470 acres planted with 100 000 coco palms should be estimated at from £11 4*s* to £16 per acre. It is not possible, at present, to reduce the difference between these two figures, but writers who estimate by the single tree and reckon the cost price of a palm of from 6 to 8 years at 6*s* 2 ½*d* or 6*s* 8 ¾ *d*, consider, taking about 40 trees per acre, that the results work out in accordance with the above figures. It seems thus reasonable to fix the capital necessary for making a plantationof 2470 acres with 100 000 coco-palms at from £32 000 to £36 000; necessarily, the sum is not equally divided over the first 7 years.

Selection and Varieties. — Messrs. Barrett, Zaepernick and Smith are not all agreed as to the existence of true varieties for selection and of general rules to be observed in order to improve the production. Nevertheless, it seems certain that the copra yield varies with the district and the cultivation and probably also according to the varieties. About 20 varieties are believed to exist in Malaysia.

Interplanted Crops. — As a rule, the cultural operations are not the subject of much controversy; but on the other hand, the question of associated crops is much discussed. The latter are increasingly planted under certain conditions. The present idea is, that those crops must be selected which give an immediate return, as they can only be planted the second year, and must be given up after the fifth, or sometimes even after the fourth year, in order, that the coco-palm may derive the entire benefit from the nutritive substances present in the soil. The plants most used are manioc, pineapple, pepper-plant, coffee (*Coffea robusta*), mimosa, and various Leguminosae, agave, maize, earth-nut, etc. Amongst the Leguminosae, *Crotalaria* is an especial favourite. *Coffea robusta* is well spoken of also, as from its second year, it is capable of yielding 160 lbs. to 180 lbs. per acre; in the third year the crop exceeds 450 lbs. and is 1800 lbs. the two succeeding seasons. These figures largely counterbalance the cost of plantation and allow of the crop being up-rooted after the fourth year, should the state of the coco palms require it.

It seems the general opinion that coco trees which are manured by grazing live stock yield earlier and larger crops; but the age at which the trees have nothing to fear from the animals is, however, still a moot point, and there are no data available as to the facilities for the purchase and sale of live stock.

Improvements and fertilizers. — It is generally recognized that phosphoric acid and nitrogen are more clearly useful than potash, although the latter is also necessary.

Farm-yard manure is one of the best fertilizers; cakes, organic manures and ground bones are also excellent, as is also especially the green manure consisting of the Leguminosae which have formed the intercalary crop. Common salt, which has been hitherto regarded as a very good fertilizer for the coco-palm, is no longer in favour and it is considered that chloride of potash fertilizers are sufficient.

Yield. — The different writers estimate the number of nuts required to produce 1 ton of copra, at from 4000 to 7000. The divergence between the figures is doutless due to the differences in the weight of the nuts borne by the different varieties which are planted.

Opening and drying the nuts. — There are a few machines for opening coco-nuts, but the writers have, so far, not taken them into account, for the extraction of the kernel by means of an iron rod, or " bolo " is considered almost generally to be the best method, and it is still believed that an excellent quality of copra can only be obtained by drying the nuts in the sun. The drying apparatus are not as yet perfect, but when they work well, they furnish a copra which is preferred by some producers and exporters.

" *Coir* " (*Fibre*). — Hamel Smith's book gives interesting details concerning the mechanical extraction of " coir ", and in particular, a description of little-known machines. The mechanical preparation of " coir " may be considered as an improvement, which permits of its being always utilized; and removes the prejudice according to which it was considered an unimportant byproduct to be collected only when possible:

Diseases and insect pests. — The writers who have been consulted mention rats as being enemies of the coco-palm, in addition to diseases and insects. Zaepernick advises the use of zinc bands to protect the trees from the attacks of these rodents. These bands are used in Europe for fruit-trees, but would be very costly in the case of a plantation of 100 000 palms. O. W. Barret gives an account of the *Coleoptera*, which can only be controlled by collecting them. " Bud rot " is the most serious bacterial disease from which the cocoa-tree suffers, it appears to be caused by *Bacillus coli*. The only method of control is up-rooting the infected palms and burning them (1).

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(1) On the diseases and enemies of the coco-palm, see amongst other abstracts in this *Bulletin*, those which deal specially with " bud-rot " pp, 368; 369 *B.*, Dec. 1910 (*Ed.*).

41 The Economic Importance to Portugal of the Cork Oak and its Products.

KLEIN (Madeira). — *Naturwissenschaftliche Zeitschrift für Forst und Landwirtschaft*, Year 10, Part 11, pp. 549-559. Stuttgart, November 1912.

Thanks to its geographical situation, its soil and its climate, Portugal possesses a rich tree flora. The forest timber which exists is mostly indigenous, but trees which have been introduced flourish equally well. Of great importance among the latter is *Cupressus glauca*; this occurs in large stands in Busaco and reaches huge dimensions; *Acacia melanoxylon* and *Eucalyptus globulus* should also be mentioned, and it is the latter which imparts to the Southern Provinces their characteristic note. From the forestry standpoint, Portugal is divided into three districts; the first that of *Pinus pinaster* Ait (pinheiro bravo), which extends from the Sado to the Minho and from the sea to the mountain chain and is swept by the sea winds. The second district is that of *Quercus suber* (sobreiro) and *Quercus ilex* (azinheiro), these trees here form not very dense forests extending over vast stretches of country, which are called "montados". This region extends from south of the Tagus to the coast of Algarve, and is almost throughout slightly undulating. Its climate is hot and dry, since rain rarely falls here between May and October. The third district is that of *Quercus pedunculata* (carvalho alvarinho), *Quercus tozza* (carvalho negral) and *Quercus lusitanica*, but the latter is of rarer occurrence and prefers the flat central portion, which it shares with *Castanea vesca*. This territory north of the Tagus is in places very mountainous, and the climate is variable and humid; heavy rain occurs, especially in the district between the Douro and the Minho. Until some decades ago, *Pinus pinea* grew in great masses in the valleys of the Tagus and Sado. But there was so large a demand for the wood of this tree for shipbuilding purposes and railroad construction, that the pines were cut down in large numbers and have not been replanted, or even replaced by the less valuable but more rapidly growing *Pinus maritima*. Now the mistake has been seen and this latter species is being chiefly planted.

The Cork Oak. — After *Quercus ilex*, which covers 618 000 acres, *Quercus suber* is the tree most widely grown in Portugal, where it occupies an area of 519 000 acres. The regions where it is chiefly cultivated lie south of the Tagus and indeed principally in the districts of Beja and Evora, in the centre of Pontalegre and in the Province of Algarve; here it often forms extensive closely growing stands. In the Tagus valley, the districts of Lisbon and Santarem and that of Castello Branco, this tree is not so well represented, but it still grows in large stands; these decrease in size towards the north, and finally only solitary individuals occur.

In south and central Portugal, the cork oak shows its usual habit; its stem is normally short and its growth compact, it branches at from 5 to 10 ft. above the ground and forms a spreading bushy crown. In the north, on the contrary, where this species occurs mixed with *Pinus maritima*, its trunk is more slender and often attains a considerable height; but this change of habit is also due to the method of pruning adopted. Here, too dense a shade is avoided, as space is needed for intercalary crops, while in the south, where the cultivation is less intense and the estates larger, more stress is laid upon a greater production of cork and acorns. In the north, the development of horizontal branches is encouraged, which are carefully pruned in order to expose the crown to the effect of light and air.

The flowering and fruiting seasons and the time of the fall of the acorns are at approximately the same dates as in other Mediterranean countries. Sometimes cork oaks attain quite large dimensions. As an example, the writer cites a tree growing in the Estremoz district, which in one season yielded 3960 lbs. of cork. As regards their growth, many young plantations ("chapparaes") yield cork fit for use 23 years after planting, while male cork is produced sooner, but the latter cannot be used in the manufacture of bottle corks.

The acorns are devoted to the fattening of pigs, although they are more bitter than the fruit of *Quercus ilex*. It is estimated that of the million pigs which are reared annually in Portugal, one third are fed on the acorns of the cork oak and holm oak (*Q. ilex*). The total harvest amounts to 200 000 tons. If the proprietor is not himself a pig-breeder, he farms out the oak forest at the rate of from 20 to 25 shillings per head of swine to be fattened. The number of these animals to be fattened in a forest is decided empirically. As a rule, the ground beneath the oaks is kept free from underwood and bushes; this promotes the growth of intercalary crops, obviates any danger of forest fires, and enables the pigs to find the acorns with greater ease. The formation and ripening of the cork is hastened by working the ground, manuring for intercalary crops, and by the pigs during the fattening season. The cork is finest and thickest when it has formed quickest. All existing cork oak forests are of natural growth, and most new plantations that are made arise by protecting a certain area against pigs and fire.

Lately, new plantations are made by sowing late autumn acorns, which are preferably obtained from oaks already known to be good cork producers. The acorns germinate very rapidly, the young trees require no further care, and on good soil, the first crop of male cork can be stripped off at the end of ten years. Planting is rare and only occurs for small stands, or in order to fill up gaps. The cork oak forests are almost exclusively the property of private individuals, who either strip off the cork themselves, or lease the forest for 20 to 40 years.

By the terms of the contract, the owner is often obliged to strip off the male cork and to superintend the clearing of the crown, etc. The tenant always undertakes to leave untouched the cambium layer ("mae"). The male cork is usually removed when the trees are from 15 to 20 years old. The operation generally takes place between June 1 and August 30, but is sometimes, though not frequently, effected in the second half of May. An interval of 9 or 10 years, often of from 8 to 12 years, intervenes between each stripping; this time is necessary to obtain cork 32 mm. (1 1/4 in) thick. In order not to weaken the tree unduly, and also because branch cork grows more slowly than stem cork, the stripping is confined to one portion of the oak at a time.

Cork Production. — An axe with a wide sickle-shaped blade is used for removing the cork. The sale unit is the "arroba" (32.38 lbs.). Cork is seldom exported in a raw condition, but is usually cut into strips according to classification; these are steamed and flattened after the defective portions have been removed. The pieces ("pranchas") thus prepared are compressed into bales of 59 × 27.5 × 23.6 inches and bound with iron bands. When bottle corks are made, the sheets are once more steamed and then cut into cubes (quadros); these are trimmed to shape, either by hand with a knife, or by means of a machine. Champagne corks are not manufactured in Portugal.

The wine corks of commerce owe their appearance to being placed in a solution of oxalic acid. When needed for other purposes, they are subjected to other operations. There are no linoleum factories in Portugal, where the cork refuse can be turned to account. The latter is, however, ground and used for floor cement; or is made into insulators.

Amongst the defects that occur in cork, "Jaspeada" must be mentioned; this is a dark cloudy discoloration giving a marbled appearance to the cork. Green patches also are to be found, caused by a mould, which grows on the unripe cork; other defects are due to the injuries caused by various insects; those due to the attacks of the *Buprestidae*, *Coroebus undatus*, *Coroebus bifasciatus*, and *Agrilus*, and which consist of tunnels bored in the cambium layer, are called "colebra." Ants of the genus *Cremastogaster* cause similar damage, while *Tortrix viridana* ("burgo") attacks the leaves and acorns. The best quality of Portuguese cork comes from the districts of Beja, Evora, Portalegre and Algarve.

Cork plantations occupy the following areas:

District of Faro	46 930 acres
„ „ Beja	145 730 „
„ „ Evora	187 720 „
„ „ Portalegre	88 920 „
Remainder of the country	40 400 „
Total . . .	518 700 acres

The annual yield of good dry cork amounts to about 50 000 tons; the total production of cork is 58 192 tons (according to the latest statistics), of this about 11 tons are used in Portugal, while the rest is exported mainly to Germany, Belgium, the United States, Brazil and especially to England. The last country buys the most prepared corks.

The writer gives several tables of the analyses of Portuguese cork, as well as of the acorns of different species of *Quercus* together with their relative nutritive value.

LIVE STOCK AND BREEDING.

HYGIENE

42 - Investigations on North American Ticks and their Control.

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The first studies made of the life history and habits of the North American Cattle Tick (*Margaropus annulatus* Say) were those of Dr. Cooper Curtice (1891, 1892). In 1898 Dixon and Spreull reported studies made on *Margaropus decoloratus*, and the same year Prof. C. P. Lounsbury in British South Africa began his classic studies of the Ixodoidea; other investigators soon followed with work on several species of ticks and among others Dalrymple, Morgan and Dodson published an account of experiments relating to the North American cattle tick and C. J. Pound published notes on the Australian cattle tick (*Margaropus annulatus australis* Fuller). Also in Germany, in India, Argentina, Brazil and Jamaica many observations on different species have been made by numerous investigators.

The Bureau of Entomology (U. S. Department of Agriculture) has conducted a course of investigation on all the cattle ticks hitherto found in the United States, and in its Bulletin No. 106 an exhaustive account (including description, host relationship, geographical distribution, life history, economic importance, etc.) of these species of ticks is given. The methods employed in the studies are also given, as well as a series of plates.

From an economic point of view, cattle ticks occupy the most important position among the ticks of North America owing to the part they play in the transmission of *Piroplasma bigeminum*, the cause of Texas fever in cattle. It has been estimated by Dr. Mohler (1905) that the cattle tick alone is the source of approximately $ 40 000 000 (about £ 8 000 000) annual loss in the United States. Mayer (1906) has estimated the annual loss as nearly $ 100 000 000 (about £ 20 000 000).

Besides the cattle tick, *Dermacentor venustus* Banks which transmits to man the causative organism of Rocky Mountain spotted fever, and perhaps *Argas miniatus* which transmits a spirochaete to poultry, are also to be considered. A good many other North American ticks are, hitherto at least, known only as ecto-parasites of man and of domestic and wild animals.

Margaropus annulatus lives usually on cattle, but the tick is often found on horses and mules, and on deer, buffaloes and sheep. But these latter animals, with the exception perhaps of buffaloes and deer, do not suffer from Texas fever.

Cattle ticks live only a part of their lives on their hosts, the rest being spent on the pastures.

The tick larvae attach themselves firmly to the skin of their host, where the female larva remains from 21 to 66 days, during which time it moults twice (like the male) and becomes a sexually mature eight-legged tick. It then mates with a male living on the same host and gorges with blood, attaining a length of about half an inch, after which it drops to the ground and lays its eggs on the pasture.

Egg-laying begins during the spring, summer and autumn months in 2 to 20 days, and during the winter months in from 13 to 98 days, after falling to the ground.

Egg-laying is retarded by low temperatures. It is completed in from 4 days in the summer to 151 days beginning in the autumn. During this time the tick may deposit from a few hundred to more than 5000 eggs. After egg-laying the mother tick dies in the course of a few days.

After a time, ranging from 19 to 188 days, the eggs begin to hatch. From each egg issue small six-legged larvae or seed-ticks which after a few days ascend the nearest vegetation, such as grass, herbs, etc., whence they try to reach a host by means of their long front legs.

The seed tick during its life on the pasture takes no food, and unless it reaches a host it dies of starvation. Its endurance, however, is very great, as it has been found to live without food nearly eight months during the colder part of the year .

The United States Congress in 1906 empowered the United States Secretary of Agriculture to inaugurate a plan of cooperation with the authorities of Southern States for the eradication of the cattle tick. The Federal appropriation for the fiscal year 1907 was $ 82 500 (about £ 16 500) and for 1908 $ 150 000 (about £ 30 000). Annually since then $ 250 000 (about £ 50 000) have been appropriated for this object. At first only 7 States cooperated with the Federal Government in the work of tick eradication. Now all the States interested in the question (with only one exception) have undertaken cooperation with the U. S. Bureau of Animal Industry.

In the eradication of ticks, either the pasture rotation method is used or the ticks are killed by insecticides applied by swabbing, spraying or dipping the cattle.

In the pasture rotation system the cattle are kept between March and September for 20 days in a pasture in which there are no ticks, then for 20 days in another such pasture and lastly for again 20 days in a third enclosure ; all these pastures must be free from ticks, so as to avoid the cattle becoming again infested with the parasites. The ticks (females) previously attached to the animals have in the meantime droppet off from their hosts and these are freed from them so long as they keep in tick-free enclosures. The three pastures grazed first must not be restocked with cattle until all the larvae hatched out from the eggs have died of starvation.

The carrying out of this rotation system, however, presents some difficulties, consequently the tick destroying agents, such as oils and arsenic, are becoming increasingly popular. Arsenical dips are very effective and during the past few years have come into much favour.

Progress of tick eradication.

STATE	Counties infected Aug. 1, 1906	Counties infected April 1, 1911		Counties released up to Apr. 1, 1911		Counties in which eradication is in progress	Square miles released up to Apr. 1, 1911	Square miles infected Apr. 1, 1911
		Whole	Parts	Whole	Parts			
Alabama	67	67	0	0	0	7	0	51 540
Arkansas	75	65	0	10	0	9	7 220	45 825
California	15	3	1	11	1	3	67 977	11 947
Florida	47	47	0	0	0	0	0	54 240
Georgia	144	141	0	3	0	6	815	57 328
Kentucky	2	0	0	2	2	0	841	0
Louisiana	60	60	0	0	0	2	0	45 420
Mississippi	78	73	2	3	2	17	2 032	44 308
Missouri	4	4	0	0	0	4	0	1 595
North Carolina	72	42	0	30	0	8	13 993	23 372
Oklahoma	59	52	0	7	0	6	7 890	40 000
South Carolina	42	38	0	4	0	8	2 673	27 497
Tennessee	42	8	4	26	8	6	11 989	17 210
Texas	190	178	5	7	5	11	13 311	178 574
Virginia	32	6	2	24	2	3	11 080	2 838
Total	929	784	14	127	20	90	139 821	601 694

A formula commonly used is the following:

Sodium carbonate	24 to 25 lb.
Arsenic trioxid (white arsenic) .	8 to 10 lb.
Pine tar	1 gallon
Water sufficient to make . . .	500 gallons

The cattle and horses are to be bathed in this dip at intervals of not more than 20 days until no more ticks are to be found on the animals.

For dipping purposes vats made of concrete are useful, and they may, in many cases, be built by the cooperation of all the farmers of a community.

Up to April 15, 1912, 162 648 square miles have been freed from ticks, and this area is separated from the tick infested country by a strict quarantine. (1)

The accompanying table shows the progress of tick eradication.

43 - The Tick Problem in South Africa (2).

MOORE, WILLIAM (School of Agriculture Potchefstroom) in: *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 377-384. Concord, N. H., Oct. 1912.

The following is a list of ticks and diseases transmitted by ticks in South Africa.

Scientific names	Vernacular names	Diseases carried	Hosts
Boophilus decoloratus Kock	Blue tick	Texas cattle fever; redwater; *Spirochaetosis*	Cattle, horses, sheep
Amblyomma hebraeum Kock.	Bont tick	Heartwater.	Sheep, goats, cattle
Haemapysalis leachi Audouin	Dog tick	Malignant jaundice.	Dogs
Rhipicephalus appendiculatus Neumann.	Brown tick	East coast fever; gall-sickness of cattle; Texas fever.	Cattle
R. simus Kock . . .	Black-pitted tick	East-coast fever; gall-sickness; *Spirochaetosis.*	Cattle
R. evertsi Neumann .	Red tick	East-coast fever; gall-sickness; biliary fever of horses.	Cattle, horses

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(1) See No. 934, *B.* June 1912. (*Ed.*).

(2) See: No. 2198, *B.* July 1911; No. 2425, *B.* Aug.-Sept.-Oct. 1911; No. 146, *B.* Jan. 1912; Nos. 358 and 359, *B.* Feb. 1912; No. 810, *B.* May 1912; No. 934, *B.* June 1912. (*Ed.*).

Besides the ticks which are known to transmit diseases, there are many others which attack domesticated animals. Among these *Ixodes pilosus* Kock attacks sheep, goats, oxen, horses, etc., and is supposed to be the cause of a paralysis of sheep in Cape Colony, and *Hyalomma aegyptium* Linn., the Bont leg tick, may be found in the adult state on all domestic animals, and is thought by some to cause abcesses on the animals. Other ticks whose injury may only amount to tick worry, are *Ixodes rubicundus* Neumann, *Rhipicephalus oculatus* Neumann, *R. sanguineus* (Lat.), *R. lunulatus* Neumann, *R. duttoni* Neumann, *R. bursa* Canestrini & Fanzago, *R. nitens* Neumann, *Amblyomma variegatum* (Fabr.) and sometimes *A. marmoreum* Kock.

The life-cycle of many of the common ticks has been worked out by Dr. Theiler, C. P. Lounsbury and C. W. Howard. The eggs of *B. decoloratus* are laid in about five days or more from the time the engorged female drops from the hosts and hatch in from three to six weeks, — in winter a longer period is required. The larvæ may live for six or eight months without feeding. The moult from larva to nymph and from nymph to adult is performed, without leaving the host animal, in about three to four weeks. The eggs of *R. evertsi* hatch in about 30 days, and the larvæ can exist for seven months without feeding. The moult from larva to nymph is performed upon the animal in about ten to fifteen days. The engorged nymph drops from the animal and moults on the ground, seeking a second host for its adult existence. The adult tick may live for as much as a year, should it not find a suitable host; it remains on the host animal from six to ten days.

The life cycle of *R. appendiculatus* is typical for *R. capensis*, *R. nitens* and *R. simus* and is given for the group. The eggs are laid by the engorged female in about six or more days from the time she drops from the host animal. These hatch in from 28 days to several months, depending upon the temperature. The larva remains on the animal for about three to eight days, after which it too drops to the ground to moult — which is accomplished in about 21 days. The nymph attaches itself to a second host animal and remains for from two to seven days, when it drops off to moult to the adult. The second moult occupies about 18 days. The adult remains on the third host for a period of four to seven days. The larval tick can exist for seven months should it not find a host, the nymph six and one-half months, and the adult nine and one-half months.

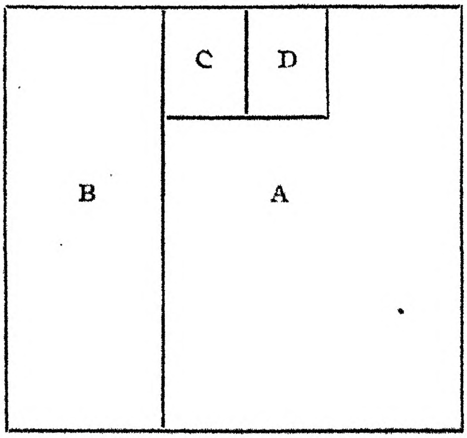
A. hebræum also has a life cycle much similar to *R. appendiculatus*. Three hosts are sought, the larva remains on the animal from 4 to 20 days, the nymph 4 to 20 days, and the adult 10 to 20 days. *H. aegyptium* differs from the above species in that the larvæ attach themselves to various birds and to hares. The larva moults to the nymph while on the bird, but the engorged nymph drops to the groud to moult to the adult. The adult attacks domesticated animals, being often very abundant upon oxen. *A. marmoreum* differs from *H. aegyptium* in that it is the larva or nymph which attacks oxen and goats, while the adult and also the nymph are very common upon tortoises.

"Trekking" and grass burning are old methods, but even yet often employed, for ridding flocks or herds of disease.

One of the farmers' favourite summer grazing sections of South Africa, is the High Veld. Over this area — lying between 4 000 to 6 000 feet of altitude — the ticks which transmit diseases are limited or nearly limited to *B. decolaratus* and *R. evertsi*, due to the fact that the other ticks cannot withstand the winter temperature. In the winter the stock farmers travel with their animals to the warm low veld, where the grass is abundant. If their animals become sick from some of the "tick diseases," they trek back to the higher country, where the disease would disappear.

By burning off the dry grass, the new green grass comes up much sooner and will furnish grazing for cattle and sheep at a much earlier date. Some farmers noticed that after the grass had thus been burned off, the animals suffered far less from ticks; the practice then came to be adoptad against the ticks themselves.

The starvation method of eradicating ticks — which has been so successful in the Southern United States, against *B. annulátus* — has been tried in South Africa, but has not been so effective. Generally here the question is not only the eradication of the blue tick, but also of the brown and red ticks and the Bont tick. In theory even these could be destroyed by placing all the animals in *B* (see the annexed diagram) and keeping them there for a period of 15 months; then transferring the animals to *C* and keeping them there for 18 days; then moving the cattle to *D* (so that the ticks which have dropped off in *C* will not have the time to moult and again seek the host) and keeping them there for another 18 days; and finally turning the animals — which are tick free — into *A*. *B*, *C* and *D* could be closed against cattle for 14 to 16 months and the farm thus freed of ticks. This method in theory would rid the farm of all the ticks which are known to transmit diseases to oxen, horses, sheep and goats. In practice, however,



Plan showing division of land for the starvation of ticks the starvation of ticks is not so easy, owing to the number of wild animals which will act as hosts to the ticks, thus carrying them over the starvation period. Of those ticks which transmit disease, but two species — *B. decoloratus* and *R. capensis* — do not find a host on the wild animals. The wild hosts of the other common African ticks are the following:

Amblyomma hebraeum: lion; wild dog; various antelopes; buffalo; giraffe; ostrich.
Rhipicephalus appendiculatus: lion; various antelopes; buffalo; Cape hare.
Rhipicephalus evertsi: reed buck; various antelopes; giraffe; Cape hare.
Rhipicephalus simus: lion; wild dog; jackal; bush pig; hedgehog.

In an actual trial of the starvation method carried out by H. E. Laws in the East London district, it was seen that the blue tick can be starved, but also that *R. capensis* seems to have some host among wild animals which has not been observed. Hares and duiker (one of the antelopes) which had been running on the experimental area were tick-infested when shot.

The usual and the most successful method employed in South Africa against ticks is dipping. The dipping fluid found most useful is that recommended by Pitchford, which is

5 ½ lbs. of soft soap;
2 gals. kerosene;
8 ½ lbs. arsenite of soda;
400 gals. water.

Even dipping has its disadvantages, if the farmer has many species of ticks to destroy. If only *B. decoloratus* is to be destroyed, dipping every three weeks will suffice; if *R. evertsi* is to be destroyed the dipping would have to be done every week; if also the brown ticks (*Rhipicephalus* sps.) are to be destroyed, dipping would have to be done every three days. In order to make dipping every three days possible, the above formula has been modified to: 3 lbs. soft soap; 1 gal. kerosene, 4 lbs. arsenite of soda (20 % arsenic); 400 gals. water. In farms of over one or two thousand acres, dipping every three days would seriously interfere with any other farming operations; it seems more practical to dip every week and continue the dipping over a number of years.

44 — Nodular, Intestinal and Ganglionic Helminthiasis.

GRIMALDI, ERCOLE: L'Helminthiase nodulaire, intestinale, et ganglionaire. — *Hygiène de la Viande et du Lait*, Year 6, No. 11, pp. 596-610. Paris, Nov. 10, 1912.

In this article, which contains the results of observations made in the Municipal Abattoirs of Genoa, the writer, after giving a review of the literature on the question, calls to mind the fact that nodular ***helminthiasis*** attacks a large number of domestic animals and some wild species, being of general occurrence. It is found in cattle, sheep and pigs, and also infests deer. It occurs in Europe, Algeria, Tunis, America, Australia and Japan and, like all parasitic diseases, spreads especially quickly among wild animals. The nodular ***helminthiasis*** of cattle is due to an ***osophagostomosis*** and attacks by preference young animals.

The eggs, which are disseminated by infected cattle, when they fall in suitable places, hatch out and the larvæ become free. It is not known whether the latter have an independent life in the ground, or pass into an intermediate host. The eggs are laid at the beginning of autumn and the larvæ at the same season penetrate into the intestines of the animals. Water is probably the vehicle of infection in the case of cattle. This parasitic disease is never found in dry districts, but occurs in those which are irrigated and where the water has remained stagnant for some time. The larvæ, having found their way into the intestine, penetrate the mucous membrane by means of their rapid movements and reach the sub-mucosa, where they usually remain. Some of them, however, traverse the muscle layer and find their way beneath the serous layer, while others penetrate into the ganglia of the mesentery by way of the chyliferous ducts. Having penetrated into the thickness of the wall of the intestines, or below the serous layer, or even into the ganglia of the mesentery, the larvæ cause the formation of nodules, within which they remain for some months. But while those which are in the walls of the intestines emigrate towards the intestinal aperture from June to July, the others never succeed in overcoming the hindrances in their path and perish within the nodules. Having reached the intestine, the parasites differentiate sexually, and eggs are produced; these are expelled with the faeces and set at liberty larvæ ready to infect new hosts. The disease is characterised anatomically by the occurrence of nodules containing a nematode larva, in the course of the intestines and in the ganglia of the mesentery. The lesions of the ganglia have an undoubted similarity to those of tuberculosis and a confusion between the two might lead to very serious consequences. *Bilharzia crassa* also produces a helminthic form of nodule, which differs in its smaller size and its less resistant capsule. Tubercle nodules differ from the parasitic ones chiefly in that the former contain more caseous than purulent matter, and are clearly isolated from the surrounding tissues, besides being often surrounded by small tubercles.

The most characteristic symptom of nodular *helminthiasis* is severe diarrhoea, the fæces being greenish and watery; this attacks several animals at once and assumes an enzootic character. The disease lasts about two months, and then gradually disappears; its evolution is slow and progressive. The sick individuals are low-spirited and emaciated; they suffer from pica and sometimes die exhausted by diarrhoea during the cachexic period.

From researches carried out by the writer on a large number of cattle, it seems logical to conclude that:

1. Bovine nodular *helminthiasis* is due to an *Osophagostoma* larva.

2. The larvæ leave the nodules to penetrate into the intestine in the months of June and July.

3. Contrary to what is maintained by some writers, the mesenteric ganglia can fairly frequently take part in the infection process and also simulate very closely one form of tuberculosis.

45 - Wireworms in Sheep and their Treatment.

THEILER, ARNOLD in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 4, pp. 572-586. Pretoria, October, 1912.

The writer first describes the development of the wireworm (*Strongylus contortus*) which lives in the fourth stomach of the sheep (1) and sucks nutriment from the mucous membrane (2). The female worm lays eggs which leave the sheep's body with the droppings. The eggs hatch out at a temterature of 40° to 50° F.; the young worm feeds on the organic matter of phe manure and reaches the so-called ensheathed form, which withstands the influence of cold or dryness. This ensheathed form grows into the adult stage in the stomach of the grazing sheep, being taken up with the grass.

It is thus very necessary that the pastures should be kept free from infection. To this end, the sheep-breeder must always have at his disposal some pasture, on which no sheep or other ruminants have been grazing for at least nine months to one year. If, however, a flock is infected, which can be ascertained by examining the sheep manure, the worms must be got rid of by dosing the sheep, and the flock should be driven to a clean pasture. If the sheep again show signs of infection, for the parasites are not always all killed by dosing, this treatment should be repeated. By adopting this system of dosing and moving on to cleaned ground, it will in time be possible to eradicate the disease.

The grass of the infected pastures should be burnt each time on the removal of the sheep. Where, however, change of pasture and burning the grass are impossible, the repeated use of vermicides is the last resource.

The two best known medicines for dosing sheep are bluestone and "Cooper's Dip" and lately they have been used in combination. The result of a series of experiments as to the safe maximum dose of this mixture may be summarized as follows:

For sheep from 4 to 8 tooth: 15 grains of Cooper's Dip and 15 grains of bluestone.

For sheep of 2 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

For lambs from five months old: 7½ grains of Cooper's Dip and 7½ grains of bluestone.

Experiments proved that smaller doses were effective and accordingly the doses recommended were as follows:

Sheep of 4-8 tooth: 10 grains of Cooper's Dip and 10 grains of bluestone.

Sheep of 2 tooth: 7 grains of Cooper's Dip and 7 grains of bluestone.

Lambs, six to nine months old: 5 grains of Cooper's Dip and 5 grains of bluestone

It was found that one dose did not in every case destroy all the worms; therefore experiments were made as to how often, and with what intervals, these remedies could safely be used and it was found that sheep could be dosed ten times at weekly intervals with the maximum safe dose and thus freed from the parasites. This also applied to lambs.

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(1) It also occurs in the goat, deer and cow. (Ed.).

(2) See No. 1544, *B*. Nov. 1912. (Ed.).

Further experiments were made as to the effect of the above-mentioned remedies: 30 pregnant ewes were given, from some days up to some weeks before lambing, the whole or the half of the maximum dose; this was followed (in two instances where twins were born) by the death of the twins. This may be due to the actual dose, since in one other instance where the twins survived, the ewe had only been given half the safe dose.

The dosing of ewes with the maximal dose of Cooper's Dip and bluestone, given on the day of lambing or some days after, had no bad effect on the suckling lambs.

A second method of dosing sheep is by placing a lick of bluestone, Cooper's Dip, slaked lime, sulphur and salt in troughs to which the sheep could have free access. Although they each consumed on average 2.3 grains of Cooper's Dip and 2.3 grains of bluestone daily over a period of three months, these remedies had no effect in improving their condition. Thus direct dosing with the mixture is preferable to the use of the lick method.

Other remedies are "Kamala", a medicine which is at present being tested, and "Bert Bowker's Powder": this, according to the farmers, seems to have the desired effect.

46 - The Action of Anthelmintics on Parasites located outside of the Alimentary Canal.

RANSOM, BRAYTON HOWARD and HALL, MAURICE C.: *U. S. Department of Agriculture, Bureau of Animal Industry*, Bulletin No. 153, 23 pp. Washington, 1912.

This paper gives a systematic summary of all previous work concerning the use of anthelmintics against parasites located outside of the intestinal lumen, and also details the results of some attempted medicinal treatment of sheep for tapeworm disease (*Chysanosoma actinoides*). From the literature quoted, it appears that anthelmintics have been claimed to be efficacious in 8 cases of human somatic taeniasis (male fern); inefficacions in 8 cases of somatic taeniasis in the lower animals (male fern); inefficacious in at least 6 cases of intestinal and extraintestinal thysanosomiasis (carbon bisulphide and male fern); efficacious in over 14 cases of hepatic distomatiasis (carbon bisulphide and male fern); efficacious in 8 cases of venal distomatiasis (salvarsan); inefficacious in 5 cases of venal distomatiasis (salvarsan); and efficacious or inefficacious, according to various authors, in an indefinite number of cases of venal distomatiasis (male fern). Objections based on a critical examination of the cases are made by the writers to these figures; on the other hand their experimental results (with carbon bisulphide and male fern) were negative. However, the total evidence collected here indicates that further work along this line is necessary and desirable.

(A bibliography of 43 papers is appended).

47 - New Feeds and their Value for Agriculture.

HONCAMP, F.: Neuere Futtermittel und deren Wert für die Landwirtschaft. — *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Part 46, pp. 635-638. Berlin, Nov. 16, 1912.

The following is a report on the results of experiments carried out by the writer on the feeding and fattening of live stock at the Rostock Experiment Station, with the object of determining the value of foods recently put upon the market.

Dry Beer Yeast. Delbrück calculates that the German breweries turn out every year about 70 000 tons of fresh yeast which hitherto were more or less allowed to run to waste.

Air-dried yeast contains from 40 to 45 per cent. of raw protein; it is consequently a concentrated vegetable food rich in proteids which might find useful employment as complementary food in the fattening of pigs.

For drying beer yeast there are a number of apparatus of the usual type; vacuum drying has also been attempted, and this would have the advantage of requiring lower temperatures and consequently avoiding those alterations which diminish the digestibility of the albuminoids.

In the writer's experiments sheep utilized, in their maintenance rations, from 89 to 93 per cent of the proteids contained in the dry yeast; the same coefficient of digestibility may be admitted for pigs also. Fattening experiments carried out with sheep and with growing pigs have shown that for sheep, dried yeast as a complementary proteic food had the same value as a mixture (of equal starch and proteid value) of cottonseed meal and sesamum cake as well as oil-free soy cake. Similar results were obtained with pigs which were fed dry yeast in comparison with fish and meat meal. These experiments will be repeated. As for cows, the writer reports that they refused all food containing even small quantities of dried yeast. The price of this substance is not high: from 8 to 9 shillings per cwt.

New by-products of oil making are: *Guizotia oleifera* cake (Nigerkuchen) and *Perilla* cake; according to the writer the former contains in its dry matter about 36 per cent. of crude protein and 6 per cent. of fat; the latter 41 per cent. of protein and 8 per cent. of fat. The digestibility is respectively 87 and 91 per cent. for *Guizotia* cake and 87 and 88 per cent. for *Perilla* cake. These figures are approximately the same as those of other oil cakes. Hansen fed *Guizotia* cakes to sheep and found that their dietetic action was not good. Considering that both *Guizotia* and *Perilla* cake are made from small hard seeds relatively rich in silica and for which high pressures are necessary, the writer does not think it advisable that they should gain a footing in the market, unless they could be sold at a very low price.

The dry matter of rye germs contains 31 per cent. of protein and 9.7 per cent of fat; wheat germs 32 per cent. of protein and 7.8 per cent. of fat. Of the protein of the latter food 94 per cent. was digested by sheep and 90 per cent. by pigs; of the former food 92 and 91 per cent. respectively. Sheep digested 89 per cent. and pigs 86 per cent. of the crude fat of wheat germs, while the respective figures for rye germs were 90 and 72 per cent. They are thus feeds rich in albuminoids and especially easy of digestion, and much relished by all kinds of live stock. Wheat and rye germs are not usually found separately, but pass together with the bran into the siftings. When however they are isolated, they can be advantageously fed fresh, that is before being allowed to become rancid, to all kinds of live stock as complementary albuminoid food

Among the *foreign pulse* that has recently appeared on the market the following may be mentioned: the Calcutta-pea (Kalkutta erbse), the chickpea (*Cicer arietinum*) and the chickling vetch (*Lathyrus sativus*); the two latter were considered poisonous, but this view seems to have been contradicted by the present observations and experiments, at least for the chickpea, while the chickling vetch might under certain conditions be poisonous. It is perhaps something similar to what happened about 1870 with lupins, which on being fed produced widely spread disease, so-called "lupinosis", that for several decades past has not reappeared.

The writer has instituted experiments on the digestibility, on the part of animals, of these various kinds of pulse Digestive tests *in vitro*, have given the following percentages of digested protein:

Native beans	95 per cent.
Chickpeas.	93 „
Chickling vetch	90 „

The use of chickling vetches appears, at present at least, not to be advisable, and according to practical men chickpeas should not be fed to horses in which they seem to cause broken-windedness

The so-called molasses feeds in general consist of substances possessing very little or no nutritive value, mixed with molasses. In order to prevent the trade in these feeds, the special legal tariff No. 3 allows only those molasses feeds in which molasses is mixed with only one explicitly declared substance. Among the absorbents recently used, there is solubilized sawdust, that is sawdust treated with sulphuric acid under pressure in order to transform the lignin and cutin into dextrose (20 to 25 per cent), with the object of rendering it more palatable; it is fed warm and mixed with a certain quantity of warm molasses. It was stated to have a high nutritive value, but the analysis made by the writer on the dry matter yielded the following results:

	Crude Protein — per cent.	Nitrogen-free Extract — per cent.	Crude Fat — per cent.	Crude Fibre — per cent.	Ash — per cent.
Crude sawdust . . .	0.88	28.63	1.25	68.64	0.60
Solubilized sawdust .	0.77	40.30	1.00	57.33	0.70

thus showing that the treatment does not modify the composition of the sawdust to any great extent. Nevertheless a portion of the cellulose is transformed into sugars (diminution of crude fibre and increase of nitrogen-free extract). The writer therefore conducted some experiments with the view of ascertaining how these sugars were utilized by animals

The results of his experiments tallied with those of other previous investigators, and showed that crude sawdust, besides not being utilized, actually diminishes the digestibility of other feeds mixed with it. Solubilized sawdust does not come up to the level of the straw of winter cereals, and when mixed with molasses (" bastol ") its digestibility is practically nil. The price demanded for solubilized sawdust is 8 shillings per cwt. a grossly exaggerated price.

It has been also suggested to mix sawdust with warm distillery by-products, but even this method does not yield utilizable feeds. Some years ago pine needles from which the resinous and tannic substances had been extracted were suggested as an absorbent for molasses. But experiments carried out then by the writer with maintenance rations showed that between the degree of digestibility of natural and exhausted needles there was no sensible difference. Recent experiments conducted by W. Schneidewind on sheep with fattening rations fully confirm the above results.

Lupins, on account of their bitterness, are not palatable to live stock, with the exception of sheep. The usual methods adopted to eliminate this bitterness are not economic. Herr H. von Fehrenteil has constructed an apparatus in which the lupins are first steamed in a Henze vaporiser, mixed with potatoes, then crushed and dried between hot rollers. According to analyses made at the suggestion of the writer, the percentage of these "lupin flakes" was the following:

Crude Protein	Pure Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre	Pure Ash
30.80	28.55	49.40	2.69	12.94	4.17

of which the following percentages are digestible:

Protein	Nitrogen-free Extract	Crude Fat	Crude Fibre
86	94	73	91

It is therefore a highly digestible product; but not even Fehrenteil's process has succeeded in eliminating all the bitterness, whilst the process of drying is perhaps still too expensive.

48 - **Hydrocyanic Acid from Linseed Cake.**

The Journal of the Board of Agriculture, Vol. XIX, No. 8, pp. 657-660. London, November, 1912.

1. *Feeding Experiments.* — Experiments have recently been conducted by the Board of Agriculture and Fisheries of Great Britain with a view to determining the effect, if any, produced on cattle by feeding with linseed cake yielding a high percentage of hydrocyanic acid on digestion with water. From a parcel of linseed, yielding 0.026 per cent. of hydrocyanic acid, cake cold-pressed at a temperature not exceeding 97° F., and cake hot-pressed

at a temperature of 160° F. were prepared. The cold-pressed cake yielded — on treating with water — 0.038 per cent. of hydrocyanic acid. This cake was fed to a heifer, 14 lb. being given each day for eight consecutive days, but no ill effects were produced on the animal. Another heifer was fed on the hot-pressed cake, yielding 0.032 per cent. of hydrocyanic acid. This heifer also received 14 lb. of cake per day for eight consecutive days and no ill effects resulted.

The above rations are very much larger than would ordinarily be given, and the linseed cake contained an exceptionally high percentage of hydrocyanic acid.

2. *Effect of Heat on the Ferment giving rise to Hydrocyanic Acid in Linseed.* — In the case mentioned above, nearly the same amount of hydrocyanic acid was obtained from the hot-pressed cake as from the cold-pressed cake on digestion with water. This result was contrary to the generally accepted view that the activity of the ferment in the linseed on the cyanogenetic glucoside, is destroyed by the heat applied in expressing the oil during the hot-press method of preparing linseed cake. It appeared desirable, therefore, that further samples should be examined in order to ascertain whether hydrocyanic acid corresponding in amount with that present in the original linseed is produced by digesting hot-pressed cake with water. The following results were obtained:

From parcel of Linseed	Seed or Cake	Percentage of Hydrocyanic Acid	Total Nitrogen per cent.	Ratio. Hydrocyanic Acid to Total Nitrogen	Seed from
No. 1	Seed . . .	0.013	3.50	0.0037	La Plata
	Cake . . .	0.026	5.00	0.0052	»
No. 2	Seed . . .	0.020	3.35	0.0060	Baltic
	Cake . . .	0.027	4.85	0.0056	»
Ne. 3	Seed . . .	0.018	3.21	0.0056	La Plata & Calcutta
	Cake . . .	0.030	4.69	0.0064	»
No. 4	Seed . . .	0.029	2.84	0.0102	Calcutta
	Cake . . .	0.049	4.22	0.0116	»
No. 5	Seed . . .	0.024	2.85	0.0084	»
	Cake . . .	0.044	4.30	0.0102	»
No. 6	Seed . . .	0.020	2.84	0.0070	»
	Cake . . .	0.047	4.33	0.0109	»

A direct comparison of the absolute percentage of hydrocyanic acid yielded by the seeds and by the cake (column 3 of the above table) is without value, as the result of removing oil from the seed is to increase the proportions of the remaining constituents in the cake. In order to ascertain whether any change has taken place in the activity of the enzyme in regard to the production of hydrocyanic acid, a comparison may be made between the ratios of the hydrocyanic acid to some other constituent, as, for example, the nitrogen. Column 5 shows that, except in one case, this ratio is slightly higher, indicating a greater production of hydrocyanic acid in the cake than in the original seed. The apparent increase may probably be due to the under estimation of the hydrocyanic acid in the seeds, owing to the difficulty with laboratory appliances in breaking down the body of the seed as thoroughly as it is done under the heavy rollers of an oil mill.

The results fully confirm those given above.

In a paper published in the *Journal of the South Eastern Agricultural College* (No. 20, 1911, p. 289) Dr. Auld states, with reference to the examination of a large number of oil cakes, that in no case was a diminished rate of formation of prussic acid noted in cakes of lower oil content which might be assumed to have been pressed at a higher temperature or kept under the influence of heat for a longer period. This statement tends to confirm the above results.

49 - Supply of Store Cattle and Slaughter of Young Cattle in Great Britain.

CATTLE

The Journal of the Board of Agriculture. — Vol. XIX, No. 8, pp. 617-623. London, November 1912.

The problem of the rise in the price of store cattle and the extent to which young calves are slaughtered has already been dealt with in the *Journal* for August, 1911 and for April, 1912.

The statistics published by the Board of Agriculture show that in the period from 1906 to 1910 the average price of stores rose by about one-seventh. Exact figures showing the number of calves slaughtered each year are not available, but there is no doubt that, leaving out of account purely dairy breeds, such as Ayrshires and Jerseys, the proportion slaughtered to the number reared is very considerable.

It is sometimes suggested that the rise in the price of stores is due to an actual falling off in the supply; this, however, is clearly not the case, for, leaving out of consideration the abnormal year 1911, the number of store cattle imported from Ireland has on the whole steadily increased in the last few years, while the number of cattle in Great Britain, other than cows or heifers in calf or in milk, has remained almost stationary.

As is shown by the following figures, the rise in the price of store cattle during the last few years is almost exactly in proportion to the rise in the value of beef.

At first sight, it seems remarkable that the increase in price has not apparently resulted in any corresponding increase in the supply. The question, however, is not a simple one of supply and demand, but is complicated by the fact that in Great Britain the farms on which the cattle industry is carried on are, to a great extent, sharply divided into three classes: 1) dairy farms, on which a large number of calves are bred, but where few are reared; 2) rearing farms (having a quantity of cheap grass land, which

Year	Average for England. Fat Cattle (1st Quality Shorthorn Type) per 14 lb. stone			Average for G. Britain. Stores (1st Quality Shorthorn Type, Two-year-olds) per head.		
	£	s.	d.	£	s.	d.
1906	0	7	0	13	0	0
1907	0	7	10	14	1	0
1908	0	7	11	14	10	0
1909	0	8	2	14	7	0
1910	0	8	7	14	16	0
1911	0	8	2	14	4	0

is not good enough for fattening), on which calves — both home-bred and purchased, are reared, but not fattened; 3) fattening farms, where purchased store cattle are fattened.

While this general division is to a great extent necessitated by natural conditions, it is possible — in the writer's opinion — that the specialisation is in many cases unnecessary or carried too far.

In order to attain success in rearing, it is essential to obtain the right kind of calf; whereas at the present time, even in the dairying districts of Cheshire and the North of England, where a good class of Shorthorn cow predominates, many calves of a decidedly poor type are bred owing to the use of inferior bulls. Generally, such calves have to be sold in large numbers every spring for immediate slaughter. On the other hand, animals known to be well-bred are always easily sold, and as a rule the demand for such is much greater than the supply.

Another obstacle is the fact that the farms adapted for the rearing of calves are very often at considerable distances from the dairying districts.

The writer gives the following suggestions as a help to the solution of the complicated problem:

1. Dairy farmers keeping good general purpose cows, such as Shorthorns, Lincoln Reds, Red Polls and South Devons, could in most cases rely on a steady demand at satisfactory prices for their calves if they used better bulls than are employed in many cases at present. Even where heifer calves are to be kept, usually only a few from the best cows are reared; a bull of the beef type could be used for the others. Some system of co-operation could be devised whereby each man would have the use of two or more bulls. It would be advisable to select for the two purposes bulls of which the progeny would be easily distinguished, *e. g.*, in a Shorthorn herd an Aberdeen Angus bull, of which the calves would practically all be black and polled, might be selected to produce calves entirely for sale.

2. The cold and discomfort of a long journey, along with the sudden and often violent change of food, tends to induce scour (ordinary scour) and other troubles, and such calves often receive a serious check from which they recover very slowly, if at all. The difficulty would be greatly lessened, if the calves were kept for a couple of weeks before being sent away. Still more could be done by proper treatment of the calves when they reach their destination. One of the best methods adopted by successful rearers is to give a small dose of castor oil and some stimulant in a little warm milk, as soon as the calf arrives, and after an hour or so to give a small meal of milk. For the first few days the calf should receive very small quantities of food at a time, and should be fed at least four times a day. If the least sign of scour appears, a dose of castor oil should be administered at once, the quantity of food reduced by one-half, and a little chalk given. (It is a good plan to leave a lump of chalk in the calf house, so that the calves can lick it as they like).

The plan of selling young calves in markets and auctions must be strongly deprecated. Rearers might combine and after inspection of the cows and arranging terms and safe-guards, agree to take the whole of the available calves from a dairy farmer or from a group of dairy farmers, in which case the rearers could have a voice in the selection of a bull.

" This is a problem well worthy of the attention of farmers' clubs and associations, and if any such feel disposed to go into the question, the Board would be pleased to advise as to what other societies it might be desirable to approach, and to do all they can to facilitate attempts to get into direct communication. "

50 - The Exportation of Zebus from Madagascar.

REUZE, ANDRÉ. L'exportation des Zébus de Madagascar. *L'Agriculture Nouvelle*, Year 22, No 1124, pp. 1051-1053. Paris, November 2, 1912.

Madagascar possesses large herds of native Zebus: the official statistics return those included in the census at 4 500 000 head.

The legs of these animals are very slender and their coat variable. They have very long lyrate horns, wide at the base and with slightly accentuated rings. Since the end of 1909, it has been attempted to export zebus for the French market, and in spite of the difficulties incurred at first, the scheme was continued, with the result that the last statistics give the number of these animals exported in 1911 at 16 253, worth about £45 200.

At the same time, the export was begun in the form of canned or cold stored meat. A factory was established at Boanamary, near Majunga, and has been working for nearly a year with every prospect of success. The Antogobato factory near Diego Suarez, which was opened first, slaughtered in one season alone, from April to October 1911, 10 000 oxen.

The exportation of this meat: 483 tons in 1910, and over 913 tons in 1911, at a value of about £63 560, together with the figures given for the exportation of live oxen, makes for the first year a trade amounting to some £110 000,

April and May are the best months for dispatching live zebus, for at this date the animals have had time to recover from the winter, and the voyage through the Red Sea is less trying, while the cattle reach France when the cold is over.

The following figures are the results of data furnished by well-informed colonists and the Butchers' Syndicate. They show the probable profit to be derived from this trade.

A live zebu of 990 lbs., with a dead weight of 440 lbs., is worth, on the spot, £2 11s. 6d ; to this must be added:

	£	*s.*	*d.*
Lading dues.		7	11
Wages of drover.		4	9
Cost of transport and food	4	19	2
Disembarking at Marseilles		4	9
Total . . .	5	16	7

The cost price at Marseilles will be £2 11s. 6d. plus £5 16s. 7d., = £8 8s. 1d. The hide pays for the slaughtering. At 5. 84d. per lb. of meat, this zebu will fetch 440 × 5. 84d. on £10 14s. 1 ½d., *i. e.* £2 6s. 0 ½d. net profit per head, from which must be deducted losses on route, thus leaving about £2. The present cargoes consist of 1200 head, so that the net profit of each voyage is about £2400 with a capital engaged of about £10 000.

POULTRY

51 – Researches on Diphtheria in Fowls and its Connection with Diphtheria in Pigeons and with Fowl-pox.

1. BORDET, J. La diphtérie des pigeons.

2. BETEGH, L. v. Ueber die Beziehungen zwischen Geflügeldiphterie und Geflügelpocken. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, I Abteilung Originale. Vol. 67, Part 1-2, pp. 41-43 ; 43-50 + 2 pl. Jena, November 9, 1912.

1. — Dr. Bordet, Director of the Brussels Pasteur Institute, has already described, in collaboration with Fally, in 1907 (*Bulletin de la Société Royale des Sciences Médicales et naturelles de Bruxelles*, Juin 1907) and in 1910 (*Annales de l'Institut Pasteur*, Juillet 1910) the micro-organism causing diphtheria in fowls, which is distinguished for its extreme smallness, being perhaps the smallest that has ever been cultivated. He discovered that the inoculation of pure cultures in fowls, by means of scratchng the nictitating membrane, causes the typical disease, and that the micro-organism is found pure in the chronic lesion consequent upon this inoculation. The etiology of this disease being explained — according to the writer — it was desirable to ascertain whether diphtheria in pigeons was due to a similar organism.

Researches on pigeon diphtheria present special difficulties because the disease is rarely severe in adult birds, and it is generally limited to small whitish patches which appear most frequently in the cavity of the mouth, or sometimes in the folds of the conjunctiva, and it cannot always be communicated to other subjects by means of inoculation of the natural virus. This is therefore only very slightly virulent; consequently its cultures are still less so. In fact the writer did not succeed in causing the disease in pigeons by scratching the culture in. Nevertheless, considering that the micro-organism is found pure in great numbers in the lesions; that it is absolutely identical to that of fowl diphtheria; that on the other hand inoculations of pure cultures of the virus from fowls have caused the typical disease (in the writer's previous experiments) and that this virus has been found pure in the lesions thus caused; lastly that both fowl and pigeon diphtheria present symptoms closely resembling each other, the writer considers it evident that the virus recently obtained is the agent of diphtheria in pigeons.

The paper includes a description of the micro-organism in the lesions and on the artificial culture media and of the methods of culture.

2. — Fowl-pox has been believed by some to be connected with human smallpox, though it is not yet known if this belief is justified or not. The writer however has succeeded in causing the phenomena of pox in fowls by means of the virus of sheep-pox: a connection between the pox of fowls and that of mammalians may thus be supposed to exist. The writer summarises the opinions on this subject of several authorities and then describes his etiological investigations and physiological observations, according to which he confirms the fact that the virus of fowl-pox can give rise in fowls either to this disease or to diphtheria while the diphtheria virus can also produce fowl-pox. He concludes that:

1. The diseases known under the names of fowl diphtheria and of fowl-pox are etiologically identical.

2. The pathogenic agents are the corpuscles described by Borrel, *Strongyloplasma avium* Borrel, which may be included among the protozoa.

The paper is accompanied by an appendix of the bibliography consisting of 23 works.

52 – Egg-Laying Competitions at the Hawkesbury Agricultural College.

THOMPSON, D. S. In *Department of Agriculture New South Wales, Farmers' Bulletin*, No. 57, 15 pp. 1912.

These competitions took place for ten years and have brought to light many interesting facts. In the tenth series, the laying hens were supplied with animal food in conjunction with their ordinary rations; this diet was of some advantage in inducing egg-laying, but it is a question whether the increase in the number of eggs obtained covered the extra expenses involved.

In the autumn, the pullets which received no meat laid as well as those which were given this addition to their rations; but in the spring and summer, the meat-fed fowls proved the best layers. In appearance and bodily condition there was no appreciable difference between the two lots of pullets; but it is noteworthy, however, that while there were no broodies among the White Leghorns, which received no meat, there were five out of thirty in the corresponding meat-fed pens. Broodies were less prevalent than in previous competition, showing that greater egg-productive development lessens the tendency to broodiness.

The whole series has been carried out on essentially practical lines. The morning meal consisted of bran and pollard mash; twice a week, the mash was scalded with liver soup and the minced liver and soup mixed with the bran and pollard. This is not only valuable for its protein content, but a tonic and appetiser. In the afternoon, grain was fed, wheat predominating, but maize was fed more frequently in cold weather; it was also given once a week as a change. Green food was fed in the shape of rape and lucerne.

In the case of good layers of Leghorn breed, it may be advantageous to keep them into the third year, but any way they should be sold on the eve of moulting in their third season. The third year Leghorn hens showed a wonderful record namely a total of 1013 eggs and this breed proved itself to be the best for egg production. The average number of eggs laid annually by one hen rose from 130 at the commencement of the experiments to 184 at the close of the ten years. During the three laying periods of a three-year-old fowl, the number of eggs produced gradually decreases.

Meat feeding was tried in the case of the ducks and with good results.

The health of the birds was extremely good, showing a lower mortality than the average of the ten tests; the general average being 6 per cent. No cases of infectious or contagious disease occurred.

FISH

53 – Stocking Trout Streams.

HERRMANN, W. — Zur Besetzung der Forellenbäche. *Allgemeine Fischereizeitung*, Year XXXVII, No. 23. München, December 1, 1912.

Mistakes are very often made in the choice of material for stocking trout streams, other *Salmonidae* being frequently mixed with the trout. In order to pay well, trout-streams should be devoted to the breeding of this latter species alone, with the addition where possible of crayfish. The type of the individual stream should be taken into consideration in the selection of the trout to be introduced.

From this standpoint, the writer distinguishes three kinds of trout-streams:

1. The typical trout stream with crystal-clear water flowing rapidly over its pebbly bed and with scarcely any plants growing in it. Here the brown-trout (*Salmo fario* L.) thrives and it would be a great mistake to introduce *Salmo salvelinus* L. or *Trutta iridea*, which would soon lose their rapidity of growth.

2. Streams with gently flowing water, soft bottoms and with some reeds growing at their edges. As the food is here more varied, quick-growing brook-trout may be put in, such as the Moosach-trout, which as experiment has proved, will not thrive in the first type of stream.

3. The third group includes all streams with a moderate fall and thick growth of submerged water-plants. The excess of food present is due to the unusual number of small animal organisms, the very plentiful supply of insects which fall into the water, and to the small fish, which fall a prey to the larger trout. Such streams are full of

fish, but trout-breeding is much hindered by the presence of less valuable kinds, such as roach and perch. The further increase of such species must be prevented by systematic clearing. Often in these cases, recourse must be had to artificial stocking with trout, and a rapidly growing species such as the Moosach-trout is to be recommended. Further, grayling, barbel and perch deserve recognition as non-migratory fish, while *Trutta iridea* can be bred at the same time as these species, for there is a plentiful supply of food and this fish will contribute to the profits and lengthen the fishery season. The breeding of brook-trout will not suffer in any way, provided roach, perch and pike are exterminated.

FARM ENGINEERING.

54 - The Use and Cost of Electricity in Agriculture.

AGRICULTURAL MACHINERY AND IMPLEMENTS

KEYSERLINGK (von). Ueber Verwendung und Kosten der Elektrizität in der Landwirtschaft.

(A Lecture given at the third general meeting of the Silesian Vereinigung für Wirtschaftslehre des Landbaues in Breslau, May 8, 1912). — *Archiv für exakte Wirtschaftsforschung*, Vol. 4. Part, 3, pp. 432-441. Jena, 1912.

The writer gives in the first place a clear explanation of the expressions and terms used in electro-technique, such as energy, power, metre-kilogramme, horse-power, ampére, volt and kilowatt-hour.

Then he enters into a description of some agricultural undertakings which are provided with electricity. The estate of Wilkau, which consists of 3642 acres of arable land and pasturage, and possesses livestock including 170 cows, 200 pigs, 40 horses and 60 draught oxen, has had since 1900 an electric plant with a dynamo with an output of 6.5 kilowatts and driven by about 11 HP.

The necessary force is supplied by a steam engine, which by means of a belt drives also directly a chaff-cutter, a mill and a grindstone. The secondary plant consists of 57 incandescent lamps, 2 arc-lamps, a 6 HP. motor for the dairy, a 1.2 HP motor for the water pump, and a portable motor of ½ HP.

An accumulator battery of 24 kilowatts supplies the current when the engine is not running.

The second estate with an electric plant is that of Piskorsine, which has a workable area of 2655 acres and live stock including 176 milch cows, 23 horses and 36 draught oxen.

The power is obtained from a suction gas motor, which works on a main shafting which by belting drives an oilcake crusher, an oat roller, a mill for crushing grain, a chaff cutter, the compressor for the "Mammut" pump, as well as a dynamo of 7.5 kilowatts. In the electric secondary plant, there are 140 incandescent lamps, 3 arc lamps, three 2 HP. motors and a portable motor of $^2/_3$ HP. The accumulator battery can produce 20 kilowatt hours.

The Guckelwitz estate has a workable area of 1942 acres, and 115 cows, 13 horses, and 48 draught oxen.

Here there is also an central electric station consisting of a dynamo of about 15 kilowatt performance, which is directly coupled with a Diesel motor of 20 HP maximum power. The secondary plant consists of 71 incandescent lamps, 5 motors, of 3, 12, 11, 4 and 3 HP, together with a portable ½ HP granary motor.

The three estates of Klettendorf, Bettlern, and Lohe are connected with the Klettendorf sugar factory central electric station.

The Klettendorf estate includes a workable area of 2949 acres and keeps 160 cows, 32 horses and 54 draught oxen.

It receives a continuous current with a tension of 110 volts. The secondary plant includes 85 incandescent lamps, a 22 HP motor as well as a 9.5 H.P. motor and a portable ¾ HP motor.

The Bettlern and Lohe estates, on account of their distance from the sugar factory, have a polyphase electric installation. The current is supplied to the estates with a tension of 5 000 volts and there transformed to the required tension of 210 volts.

The electric plant of Bettlern (which estate consists of 3076 acres of workable land and possesses 205 cows, 36 horses and 50 draught oxen) includes 153 incandescent lamps and 6 motors of 25, 7.5, 5, 1, ¾ and 10 HP.

On the estate of Lohe (workable area 2104 acres; live stock: 132 cows, 23 horses, 26 draught oxen) there are 118 incandescent lamps and 6 motors of 32, 10, 4, 2, 1, ¾ HP. After describing these 6 electric plants, the writer turns to the question of their cost.

The instalment cost at Wilhau was £563 10*s*., at Piskorsine £1401 8*s*., at Guckelwitz £2205; at the three estates of Klettendorf, Bettlern, and Lohe (which have no primary station of their own) the expense was £367 10*s*., £980 and £ 739 18*s*. respectively, without reckoning the outlay on alterations, or building. The cost of working the electric machines amounted on the three estates which have their own primary stations, and each requiring the service of a thoroughly trained mechanic, to £63 14*s*. and on the other estates to £24 10*s*. per annum per estate.

The expenses of grease, cleaning and repairs were £15 17*s*. to £39 4*s*. per estate per annum. The cost of fuel was:

At Wilkau, with own steam plant	£147
At Piskorsine with a gas engine	£48
At Guckelwitz with Diesel motor	£39. 4s.

Thus the direct annual working expenses are;

At Wilkau in round figures	£240
At Piskorsine " "	£147
At Guckelwitz " "	£122

without interest or amortisation.

Through the electric-meter the following amount of current was registered as used per annum:

At Wilkau	about	5 000	K. W.	hours
At Piskorsine	,,	5 500	,,	,,
At Guckelwitz	,,	16 000	,,	,,
At Lohe	,,	10 000	,,	,,
At Klettendorf	,,	24 000	,,	,,
At Bettlern	,,	28 000	,,	,,

The reason of the great difference in the amount of electric force used is that at Wilkau and Piskorsine, the engines requiring most force are not driven directly by electricity while at Guckelwitz and on the other estates direct electric force is used for all the engines. Further, Klettendorf and Bettlern also drive the grain crusher, oat roller and oil-cake crusher belonging to two other neighbouring estates. For this reason the cost of the single kilowatt hour, also in Wilkau and Piskorsine, can only be accurately estimated if it is known what part of the expense was incurred by the engines which were directly driven without electricity. In Guckelwitz the average annual cost of the kilowatt hour, in the last two years, *exclusive of interest and amortisation* was, 1.2*d.*

This sum per kilowatt-hour represents the expense of a modern electric primary plant suitable for such an estate at the present time.

If it is considered that the cost of the interest on the capital and the amortisation of the plant, is not included and that it is not always well to sink much capital for many years in installing an electric plant, the above figure may probably be considered as affording data for estimating the price of a current supplied from a central station by overhead conductors.

The writer adds to these figures other observations.

If threshing could be performed by electricity at Guckelwitz, the cost of the kilowatt-hour would be lower, for the annual consumption of force would be considerably increased without raising the working expenses. On the other hand, the expenses of interest and amortisation would greatly rise, so that the whole cost of the plant would remain unchanged.

If, as in Guckeliwitz, the motor only drives the dynamo, and all the other machines are driven by separate electric motors, the advantage is gained that each machine can be set going at will and work separately without incurring the loss of force entailed through a principal belt-gearing.

The writer considers that the Diesel motor wears well as a driving motor, uses little fuel, is seldom out of order, and costs little for repairs; it is thus much more satisfactory than the suction gas motor or the steam engine.

Electric threshing makes great demands on the central electric station: the Diesel-motor and the dynamo have to be nearly twice their usual size, which results in a larger amount having to be set apart for interest and amortisation.

If it is required to drive a modern threshing machine with pneumatic straw stacker (a 63 inch fan drum; hourly performance about 40 cwts.) by electricity and make the straw into bales by means of a straw press at the same time or to chop it and to stack it with a pneumatic elevator on the spot, a motor of at least 30 HP must be selected. To drive a "Mammut" threshing machine of about 40 to 50 tons performance daily, a motor of at least 80 HP is required, if the straw is to be pressed or chopped at the some time. For the motor power must be equal to the greatest demands which may be made on it, in order that there may be no interruption of the work. Assistance may be afforded by providing the motor with a fly-wheel; this, like the weighty portions of the steam-engine when in motion, more or less counterbalances the unavoidable sudden variations in the power required during threshing operations.

The question whether threshing by electricity when attached by over-head conductors to a central station is preferable to threshing by steam, must be decided on the merits of each individual case. The answer depends upon different circumstances: *e. g.* the amount of space available for threshing, the expense of the electric conductors and whether the steam-threshing plant is new or not.

Portable motors are much to be recommended for driving winnowers, sorters, grindstones, machines for making straw ropes and any other machines which do not require much force. The use of apparatus for starting or stopping motors to drive water-pumps, by means of floats in the tanks which automatically throw them into or out of gear and thus make the pumps self-acting, is also very advantageous.

With regard to the systems of lighting, arc lamps entail a good deal of work, and as on a farm the suitable staff is usually lacking, incandescent lamps are better.

All lamps should be distributed as well as possible and the switches should be placed in easily accessible places.

The best switches are those with patent keys, as they can only be used by the person whose duty it is to turn the light off and on. In large stables multiple switches are to be recommended. In order to lengthen the working time in the winter and autumn months, the barns should also be lighted by electricity. A lamp of high candle power should also be affixed outside the threshing-floor, in order that the mechanics may have sufficient light to attend well to the engine.

All the advantages and conveniences, which electric lighting affords are, according to the writer, bought at a very high price. The expenses of lighting a unit of the workable land by means of petroleum and spirit amount on an average to 1.8*d* per annum and acre, in the case of twelve estates where electricity was not employed (workable area 24 172 acres).

The expense incurred on the six estates, where electricity was used in addition to other illuminants was 0.58*d*. per year and acre (workable area 16 360 acres).

On the six last estates, the cost of the electric lighting only amounted to $^2/_3$ of the total expense of illumination of 1.8*d.* per year and acre and thus should only have amounted to 1.22*d.*; in reality, however, the cost was about 2.45*d.* per year and acre.

Adding to this the 0.58*d.* expended on petroleum and spirit on the six estates where electric light was used in addition, the total lighting expense per year and acre (not including interest and amortisation) was about 3.03*d.*

It can therefore only be decided upon the merits of each separate case, whether the advantages offered by electric lighting justify the additional expenses incurred in its use, and further, whether electric light shall alone be employed or electricity also be used as the source of energy.

The electric motor possesses the great advantage of fulfilling all the requirements for driving machines and of doing this in a more satisfactory manner and with less expense for reconstruction or building than is entailed by the use of any other engine. Also it needs very little attendance.

The writer had only negative results in the electric plough experiments which he carried out in 1902, on account of the loss in the continuous current conductors and because the motors used were not sufficiently powerful.

Since that date, however, much progress has been made in electrical science, on the one hand from the use of high tension polyphase electric currents, and on the other hand from motors having been devised which correspond to the actual needs of ploughing operations.

RURAL ECONOMICS

55 – The Capitalization Value of Real Estate.

RURAL ECONOMICS

LAUR, ERNST: Der Ertragswert der Liegenschaften. — *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 21, pp. 705-721. Stuttgart, November 1, 1912.

In No. 2 of the Archiv für exakte Wirtschaftsforschung, 1912, the writer has published a paper upon the estimation of the capitalization value of estates from the gross farming returns (1). He showed how the capitalization value can be better ascertained by a property valuation based upon the gross returns. The direct estimation of the gross returns, and the expenditure and the valuation of the estates by means of the net profits thus obtained was rejected as being too difficult.

A few weeks later appeared Prof. Aereboe's new work "Taxation von Landgütern und Grundstücken". The author also rejects the valuation based on net profits. While, however, Dr. Laur considers the capitalization value as an important factor, Aereboe repudiates it entirely. In this work, the writer thoroughly investigates the radical demand of Prof. Aereboe, which would entail a revision of the laws of valuation which are based upon the capitalization value and which he considers retrogressive.

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(1) See No. 1337, *B*, September 1912. [illegible] (*Ed.*).

He thinks Dr Aereboe's definition that the capitalization value of an estate should be estimated from the net profits to be expected in the future to be too narrow a conception and distinguishes between past capitalization value, *i. e.* that which can be ascertained, and future capitalization value, which can only be estimated. The latter is the more important for purposes of valuation; the former however is indisputably of the nature of capitalization value. That the estimation of the capitalization value depends on the net profits of the past is no argument against this method. The estimation of the market value, which is recommended by Aereboe as the only correct one, must also be based on the past, and it is easier to arrive at probable future net profits from the consideration of dependable past capitalization values, than to estimate future market values from the sale prices of the past.

Aereboe's second argument against capitalization value is that the basis for this is not obtained by the estimation made by one valuer, but only by taking the valuation of the generality. This objection does not touch the essence of capitalization valuation, but only its possible misapplication, for the estimation is arrived at from the average capitalization value of similar estates. Aereboe finds an additional difficulty regarding capitalization value in the fact that opinions differ as to what should be considered as forming part of the net profit of an estate.

According to the writer, however, the difficulties in the estimation of the changes in the capital have little effect on the average capitalization values of several estates.

Aereboe believes that valuations made on the basis of market values would include fancy prices which exceed the agricultural value of the property and considers that, for this reason, the above method is preferable to estimation by capitalization value. This, however, the writer believes to be rather a disadvantage, for the relation between the average capitalization price and the mean market value gives a measure of how far the sum exceeds the local customary prices of land.

Aereboe also advances against capitalization value, that equal incomes under the different conditions of everyday life have very fluctuating purchasing power, or in other words, that the amount of pleasure and comfort which can be obtained for the same money is subject to great variations according to individual circumstances, and that an estate is, in the first place, a man's home and only secondly a source of profit. This objection in no way lessens the importance of capitalization value, which tells us what the estate is worth in capital, independently of the wants of the owner, whether these be few or many. If, in addition to the agricultural advantages, the possessor is willing to pay for the convenience of proximity to a town, he should know how far he is doing this, and for this reason it is again necessary to be acquainted with the capitalization value.

Aereboe then draws attention to the rate of interest, and says that equal returns with equal indebtedness of capital have to pay very different rates of interest annuities and that the income of the agriculturist consists entirely of the difference between his returns and the interest he has to pay on his debts. This faulty manner of estimating the value of property is, according to the writer, no reason why the science and teaching of valuation should give up a correct method. Interest on debts and annual payments cannot, of necessity, be included in the capitalization value, and this does away with the objection that the rate of interest in a country varies according to time and place.

Aereboe also considers that the conditions of taxation are a ground for rejecting capitalization value, for the value of the property depends on the rate of taxes.

Aereboe also alleges against the adoption of capitalization valuation that the latter does not cover the price of the estates. This is true, but when the capitalization value of a property is ascertained, it affords the buyer a means of calculating the risk he runs, in accepting the market price, of paying the property more than it is worth, and at the same time allows him to know how much more he pays it. On the contrary anyone who takes as basis only the average market price is no wiser than other would-be buyers and has not a really clear idea of what he is doing.

Aereboe looks upon the price of an estate as the result of a long building up of the market value and a criterion of the capitalization value of the property. According to the writer, however, he over-estimates the circumspection and foresight of the intending purchaser, for the present times clearly show the small part played by capitalization valuation and the large element of speculation in land purchase. The purchaser who does not take the capitalization value as a basis will always value the land too high, and if the land were to cost all farmers such high prices as correspond to the average sale prices of every decade, farming would almost cease to exist. The market values must be supplemented by estimates which consider the land exclusively from the standpoint of its returns. According to the writer, the capitalization valuation affords the best security against excessive prices being paid for estates; the recognition of the market value as a basis for judging the conditions of the returns of an estate and the rejection of capitalization valuations would be a step which might easily prove fatal to the agriculturist.

The intending purchaser learns from the statistics of the prices paid whether the sum demanded is above or below the usual average. The capitalization value affords him a means of calculating the money returns which he can expect.

As for the valuation of mortgages, Aereboe is of opinion that the value of the security is given by the price which can surely be obtained by the sale of the estate, within not too long a period, excluding from it the value of all those parts of the property that are liable to deterioration (devastierbar). The writer does not see why the capitalization value should not afford as good a basis of estimation as the market value. The Swiss Civil law has defined the following limits for mortgages for which the Cantons are responsible, since they provide the valuations: A mortgage can amount to two-thirds of the capitalization value of the land and to one-half of the value of the buildings. The security of these mortgages is so large that the Cantons have not hesilated to make themselves wholly responsible for the valuation, in order that it may be made with all possible care. The writer does not consider that Aereboe's method of valuing the security is in any way an improvement upon the Swiss enactment.

Aereboe rejects the estimation of the capitalization value even in the case of the succession duty and maintains that this should be based on the market value. He admits, however, that the market values of properties in a whole district usually exceed the capitalization value of these estates and sees the necessity of reducing them.

The writer readily agrees that the expropriation valuation must be based on the market value of the properties. Only in the rare cases where the capitalization value exceeds the market value can the owner be justified in demanding a sum of indemnity based on returns.

Neither the theory nor the practice of agriculture, nor legislation, can in any way be induced by the objections of Aereboe against the estimation by capitalization value to give up the important postulate that the land is a capital yielding profit and that its capitalization value plays the chief part in its valuation, mortgaging, sale, inheritance and taxation.

The objections which Aereboe makes against the form of the so-called Ertragstaxe (calculation of net income) are so far admitted by the writer, that he allows that the net income can only be ascertained by a system of book-keeping calculating separately gross returns and expenses but cannot be as certained from only one of these items. While Aereboe abandons the capitalization valuation also on practical grounds, the writer sees the possibility of giving the valuer accurately calculated average capitalization values by means of the formation of agricultural book-keeping offices. In the work mentioned at the beginning, the writer has shown how the material collected by the Swiss Peasants' Secretariat on the profitableness of farming can be made use of in estimating the capitalization values.

With the help of such returns, the Swiss Peasants' Secretariat hopes in the course of time to draw up the average capitalization values and their factors in the different districts and under the various conditions obtaining in the country. According to the writer, Aereboe's suggestion deserves the fullest support. The latter wishes for the establishment of special valuation bureaus to which should be entrusted the work of collecting the market prices; in the writer's opinion these valuation bureaus should also collect capitalization values. Work has been done already for some years in this direction in Switzerland and in the course of last summer, the Swiss Peasants' Secretariat was commissioned to forward suggestions respecting an intelligence bureau for the valuation of property. It was a question also of the establishment of a Swiss Peasant's Association, which should assist the peasant to extend the advantages of the new civil legislation also to the spheres of the laws of inheritance and of the mortgage of property.

56 – Farming Problems according to Working Expenses and Difference of Net Returns.

OSTERMAYER, ADOLF. Landwirtschaftliche Betriebsfragen im Lichte von Produktionskosten und Reinertragsdifferenz. — *Archiv für exakte Wirtschaftsforschung*, Vol. IV, Part IV, pp. 608-636. Jena, 1912.

The author endeavours to show by means of some examples the value that the calculation of the cost of production has in judging some problems in farming. In valuing agricultural produce he applies the simplest principles of practical experience. Thus, for instance, the money value of farmyard manure is calculated according to a farm price which varies with the quality of the manure and the soil of the farm ; and for the sake of simplifying matters it is debited in equal proportion to all the crops of a rotation, while the labour of the hands and teams employed in the operation of manuring are debited to the crop which receives the manure.

Next follows the average cost of production of a series of crops, calculated on the account books kept during the year 1910 in nine peasants' farms in Moravia. In the cost of production the interest at 4 per cent. of all the capital invested in the farms is included as well as the wages for the manual labour of the owner, but no indemnity for the direction of the farm. The difference between the cost of production and the effectively obtained realisation prices does not represent the net returns, but the so-called difference of net returns (Reinertragsdifferenz), that is, the difference between the effective returns and the minimum interest required on the capital invested.

The writer shows that the cost of production varies inversely with the gross returns and that consequently it depends in the highest degree upon the many risks with which farming has to reckon. If the figures, which are obtained from farms which have remained exempt from all injurious influences be compared with the average costs of production, the differences show clearly the characteristics of the year.

In the practice of illustrating the farm by means of book-keeping, the mean values drawn from the averages of several years are used, while the results of one year's accounts are useful in enabling comparisons to be made between them and their causes.

The data in figures given by the writer prove that the cost of production of winter cereals is throughout higher than that of spring wheat. Sugar-beets and mangolds show no important difference between them. The high cost of production of potatoes seldom allows of this crop being a paying one, whilst the cost of production of hay ensures the profitableness of this forage.

Rye and oats cost less in the mountains, while for wheat and barley the conditions of the plains are more favourable.

The depth of soil in the plain satisfies better the requirements of hoed crops, while the greater rainfall of the mountain climate is favourable to meadows. The calculation of the costs of production confirms thus the old experience that the farmer must adapt his work as much as possible to the natural conditions of production.

The employment of artificials reduces the cost of production of field crops and the systematic working of meadows reduces the cost of their produce by increasing the output.

The annuities for interest and amortisation of plain farms, on account of their greater value, are higher than those of mountain farms, which require greater quantities of seeds, of team work, of farmyard manure and of artificials.

The writer then proceeds to examine the question from the point of view of the profitableness of the farms.

The item of labour, on account of its importance, being one of those that weigh heaviest on a farm, has the greatest influence on its profits. With average daily wages at 1*s.* 4¼*d.* (exclusive of board), normal amortisation, and 4 per cent. interest on the whole capital, only sugar-beets in the plain farms and forage crops in both plain and mountain farms yield a profit higher than the interest. The profit on beets is the one that most feels the oscillations in the wages of labour; potatoes follow, then wheat and last of all forage crops. Only the latter afford sure profit even with considerably rising wages and in the mountains continue to do so longer than in the plains. The present costs of production indicate clearly to farms in the mountains the profitableness of forage crops and live stock raising, and that, with the increase of wages, the intensity of farming can only be maintained on the most naturally favourable soils and by replacing to the greatest extent manual labour by machines.

The oscillations in the prices of farm produce have also a very great influence on the net returns, consequently on the profitableness of farms; the sensibility of a farm to the rise and fall of the prices of produce can be judged by the range of its net income.

In a general average for all the farms examined, the greatest sensibility exists in connection with the prices of live stock, then follow the prices of cereals and thirdly the prices of milk. Among the prices of cereals, the variations in those of barley are most felt; they are followed by those of wheat and rye, and last of all by those of oats. Among live stock, the prices of oxen exert the greatest influence on the net profits of the Moravian peasants' farms; next come the prices of calves and of pigs. Here also a difference must be made between plain and mountain farms, inasmuch as the latter are more interested in the prices of live stock than of cereals, while the net returns of the former are more dependent upon the prices of cereals than of live stock. In general, the profits of plain farms are much more affected by all oscillations in the prices of produce than those of the mountain farms.

A comparison of the effects of variations in prices on the net returns of farms of different sizes shows that the prices of wheat affect large farms more than small farms, which feel more the changes in the prices of live stock. Both the large and the small farms have, however, per unit of surface, the same interest in suitable steady prices of wheat and of live stock and consequently in a customs and commercial policy which will ensure such prices.

Book-keeping thus points out to the farmer the lines on which to organize his work, and at the same time it renders incalculable services to agricultural policy and economics.

57 - The Work of the Office of Farm Management, of the United States Department of Agriculture.

SPILLMANN, W. J.: *U. S. Department of Agriculture, Bureau of Plant Industry*, Bulletin No. 259, 84 pp. Washington, October 1912.

In Part I of this Bulletin the attempt has been made to present an outline of the science of farm management, in so far as the knowledge of the principles of this science is available, and to point out the principal deficiencies in this knowledge. The object of Part II of the Bulletin is to present an outline of the organization and work of the Office of Farm Management, with sufficient discussion to make clear the methods of investigation followed and the purposes to be attained.

The work of the Office of Farm Management is divided into five sections as follows:

(I) *Office administration and records.*
(II) *Farm economics.*
(III) *Special farm-management studies.*
(IV) *Farm management field studies and demonstrations.*
(V) *Utilization of cacti and dry-land plants.*

(I) The first section is responsible for the care of the library and the office, such as correspondence and field reports of the staff; for the preparation and care of photographic records; for the revision of manuscripts; and for the financial records of the office.

(II) The subdivision of the work in the Section of Farm Economics is based partly on methods of investigation and partly on subject matter. The various types of investigation in progress are agricultural cost accounting, farmmanagement surveys, farm equipment, marketing farm products, agricultural credit, agricultural insurance and history of farm management.

Several methods, differing more or less, are used in cost accounting work in the Office of Farm Management.

One of these is as follows: Detailed records of all labor performed and of all transactions occurring on a considerable number of farms, are received in the office, and tabulated in such manner as to show the cost and income of each enterprise on the farm, as well as the general farm expenses which can not be charged to any particular enterprise. This renders it possible, at the end of the year, to determine the profit or loss from each enterprise, as well as of the farm as a whole.

In this work the office of farm management is co-operating with the Ohio Agricultural Experiment Station, the University of Wisconsin and the University of Missouri, the records from farms in these States being received and tabulated at the institutions mentioned, and copies of the tabulations being transmitted to Washington. The records from farms located in other States are received and tabulated in the Office of Farm Management.

Another method differs from the foregoing in the fact that the farms furnishing the records are located in a selected locality and are visited at frequent intervals by a representative of the office; these groups of farms are known as cost-accounting circuits. A representative of the office devotes his whole time to the 15 to 20 farms constituting one of these circuits.

In co-operation with the New York State College of Agriculture, at Cornell University, the office employs a man who devotes his time to helping a number of farmers, in the State of New York, to develop systems of bookkeeping including cost-accounting records.

The Office of Farm Management also furnishes to several hundred farmers, well destributed over the country, a special form of diary, and instructions and suggestions are made to the farmer, as to the records and tabulations it is worth while to keep. Experience with these diaries has shown that they give much valuable data concerning the cost and income from farm enterprises, and the dates when various farm operations occur. This latter information is of special value in studying the important question of the seasonal distribution of labor on the farm.

Besides the cost-accounting investigations just described, which refer to the whole farm, others are conducted on single enterprises with the aid of representatives visiting a large number of farms on which the enterprise under investigation is conducted.

The following is a partial list of the subjects on which the records obtained in the cost-accounting work furnish date of more or less value:

Kind, number and dates of operations required by every enterprise.

The character of crew (men, horses and machinery), and the amount of work per day and total time required for each operation.

The proportion of days in a given period that are available on the average for field work, or, the proportion of time lost from rain, holidays, necessary trips to town, unavoidable delays and the like.

Cost of production and income from the various farm crops and types of live stock under a wide range of conditions.

The general farm expenses, or the "overhead charges" on the productive enterprises of the farm.

The returns per hour of labor spent on different enterprises.

The amount of use, and hence the cost per acre and per unit of product, of each item of equipment, and its rate of depreciation, determined both from the successive annual inventories and from the length of time an implement lasts and the amount of work it does.

Length of the working day.

Time required for "chores" on farms of different sizes and types.

The relation of all phases of farm practice to crop yields.

The practicability of various crop rotations.

The conditions to which various farm enterprises are suited, and their relative profitableness.

Crops which compete and those which do not compete for labor at the same time of the year.

Relation of size and type of organization of farm to profit.

The cost of marketing farm products.

The rate of income on capital invested in farming.

The labor income of the farmer.

Distribution of capital between the various factors of production, such as land, buildings, fences, work stock, productive stock, implements and machinery, etc.

Cost of housing and feeding farm animals.

Cost of horse labor.

Cost of man labor.

Types of records adapted for use by the farmer.

These investigations cover practically the whole field of farm management, but many of the above data can be secured by cheaper methods.

Another important line of investigation conducted by the Section of Farm Economics is the farm management surveys. In this work localities are selected that are believed to be representative of important agricultural regions, and studies are made on every one of 500 or 600 contiguous farms, no farms being omitted from which it is possible to obtain the necessary data. These surveys are intended to reveal the actual status of the agriculture of the regions in which they are made.

Sufficient data are obtained from each farm to enable the investigator to determine the amount of capital invested, the value of all the major items of equipment, the amount and character of the farm expenses and receipts, the increase or decrease in the farm inventory for the past year, and all other facts necessary to determine the labor income of the farmer, after deducting interest on the investment, and wages for the unpaid labor done by members of the farmer's family other than the farmer himself.

The data obtained also permit the study of such questions as the relation of profits in farming to the education of the farmer, the relation of the age of the farmer to the percentage of tenant farming, the effect of distance from markets on the value of farm land, and numerous other questions of importance to agriculture in general.

The methods used in the investigation of equipment problems are closely similar to those used in the farm management surveys, though they are more detailed than the latter; the data are in the main obtained by personal visits to the farms studied, careful inventories of the various items of equipment being made. The study of actual practice, on a large number of successful farms, is thus the best means of arriving at the solution of many of the problems relating to farm equipment. The following is a brief outline of the more important subjects under investigation relating to farm equipment.

Distribution of capital between the various factors of production: The relative amount of capital invested in land, buildings, work animals and other stock, implements and machinery, supplies, and ready cash for current expenses on farms of different sizes and types in different climatic regions.

The farm dwelling: Its cost, peculiarities, interior arrangement, design, and construction.

Other farm buildings: Amount and character of inclosed space needed under given conditions; space units per animal; the arrangement of the inclosed space in relation to convenience and economy; the location of buildings with reference to each other and to the farm as a whole; the cost of buildings under all conditions; the cost of keeping buildings of different types in repair; and the rate of depreciation of buildings.

Farm fences: Conditions requiring or justifying fences; relation of the layout of the farm to economy in fencing; the cost of fences of different types; the amount of labor required in constructing fences; the cost of keeping them in repair; and their rate of depreciation.

Water supply and sewage disposal on the farm: Types of equipment and cost and practicability of the same.

Systems of heating and lighting farm buildings and the cost of installing and operating the same.

Equipment of farms of a particular type.

Relation of the size of the farm to the character, especially the size, of the equipment.

Equipment for particular enterprises.

General farm equipment and minor items of equipment.

Equipment for particular operations: this includes a study of the wide variation in farm practice in performing the same work and of the causes underlying this variation; the cost of a given operation when performed with different equipment.

Duty of machinery: namely the amount of work a machine or implement does, or should do, in a given time.

Standards of farm labor: A study of the amount of labor that may fairly be expected of a farm laborer under all conditions and in all kinds of farm work. Data of this kind are of enormous value in the management of hired labor, as well as in planning in advance a season's work, or in making out a working plan for a farm.

The proportion of time available at different seasons of the year for work of different kinds, especially for field work. The amount of labor and the number of work animals needed on a given farm at different seasons of the year.

Equipment charges: The rate of depreciation of farm equipment of all kinds; the cost of repairs; the cost of housing implements and machinery; the rate of interest on money invested in equipment of different kinds; and the amount of annual use of equipment and its bearing on the equipment cost of farm operations.

The conditions, especially the amount of use, that justify the purchase of a given item of equipment. Conditions which make hiring more desirable than the purchase of equipment.

Advantages and disadvantages of joint ownership of the more expensive machines and implements.

Use of mechanical power instead of horse power on the farm: Attention is given to types and sizes of tractors in use; conditions to which the various types are best adapted; conditions which justify the purchase of a tractor, also its original cost, the cost of repairs, and its rate of depreciation; the cost of operation and the crews and supplies required; the amount of work done per day and per season; and the cost per unit of work done.

Ancient and medieval literature regarding farm management, while by no means extensive, is yet sufficient to enable the careful student to gain a fair idea of economic conditions in agriculture at most stages in the history of European nations. A careful study of this old literature is being made in order to summarize for publication such of it as will interest farmers.

A study is made of the methods used in different parts of the country in preparing farm products for market, especially those that go to the ultimate consumer in the form in which they leave the farm, with special reference to the effect these methods have on the prices received; methods used in transporting farm products, especially perishable products, to distant markets, and the relation of these methods to market values; methods of organizing and conducting co-operative marketing associations; the effect these associations have on the net returns received by the farmer;

the distribution of enterprises with relation to the market centres ; and finally the difference between prices received by the farmer and those paid by the consumer and the reasons for this difference.

An investigation is made of the sources of available credit for the farmer, the conditions under which he may obtain it for financing his operations, and the rates of interest on farm loans.

A study is also made of farmers' mutual insurance societies, their organization and conduct, and the rates of insurance paid.

The three subjects just enumerated belong to rural economics rather than to farm management, but are investigated in the Farm Management Office on account of their intimate relation to the subject of farm management, as well as for administrative reasons.

(III) This Section devoted to special farm management studies has given special attention to the problem of tenant farming, which is not only important at the present time, but is likely to become more so in the future. In fact it can hardly be doubted that tenant farming will further increase in the United States, and that ultimately the land will largely be owned by the wealthier classes, and be farmed by tenants with moderate capital.

Two phases of the subject are receiving special attention : one of these relates to the amount of working capital required to conduct a farm properly, especially with a view to maintaining the fertility of the soil, and the possibility of inducing the landlord to furnish this capital where the tenant is unable to do so. The other relates to the details of the contract between landlord and tenant.

Another problem under investigation is the relation existing between the distribution of different types of farming enterprises and the geographical factors, so as to ascertain what are the real limiting factors in the distribution of the enterprises.

The study of the problems of clearing and utilizing logged-off land, though not strictly a subject for farm management investigations, has been carried on by the Office of Farm Management, which is investigating the methods in use in the various sections of the country where these lands are being put into cultivation, as well as studying problems connected with the improvement of these methods.

The Office of Farm Management is also engaged in gathering up careful records of the effect of definite systems of farming on the fertility of the soil, especially those that give satisfactory crop yields. Studies are being made of all the leading farm crops of the country, to find out the economic conditions which render their cultivation desirable.

Farm practice in weed control and in the matter of tillage is also investigated in this Office, and particular attention is also being given to the relation of weeds to the various crop rotations practised in different sections of the country.

The farm management features of haymaking, relating to the amount and kind of labor required, to the cost of production and the best manner of utilizing the crop as a source of revenue on the farm, are also studied.

Special attention is being paid to the cropping systems used on successful stock farms in all sections of the country and also to the maintenance of pastures and their place in the economy of the farm.

(IV) In the administration of the work of the Section of Farm-Management Field Studies and Demonstrations the country is grouped into three divisions as follows: The North Atlantic and North-Central States, the South Atlantic and South-Central States, and the Western States. In the cotton-producing States the demonstration work is conducted by the Farmer's Co-operative Demonstration Work. A division leader has charge of the work in each of the foregoing groups of States. Each of the geographic divisions mentioned is subdivided into groups of a few States each, and the division leader has an assistant or district leader in each of these groups. They devote their time mainly to the investigation of farm practice, but assist in the supervision of demonstration work. In the cotton States their whole time is devoted to investigations.

The objects to be accomplished by the work of the Section of Farm Management Field Studies and Demonstrations of the Office of Farm Management may be briefy stated as follows: 1) To carry to the farmer the results of scientific research on his behalf, as well as the results of the experience of other farmers, and to aid the farmer in applying these results to his work.

2) To reorganize and redirect the agriculture of the various sections of the country in such a way as to secure, on each farm, not only enterprises that are profitable in themselves, each being so conducted as to bring maximum net returns, but also to secure a system of enterprises that will permit the largest economical use of power, capital and labor possible under the conditions, and which will give, as nearly as possible, an even distribution of labor and a full utilization of equipment throughout the year.

(V) When the Office of Farm Management was organized and the work with grasses and forage plants transferred elsewhere, the work with the cacti and dry-land plants was retained, because of the personal interest of representatives of this office in certain important problems relating to these, and it has since been maintained in the Office of Farm Management. The first investigations of the cactus, as an economic plant, represented a study of farm and range practice in the use of these plants as forage for cattle. Much time has been spent in working out the cultural details of the cactus, when grown as a farm crop, and several feeding experiments have been conducted to determine its forage value.

The range investigations being carried on by this office are designed to secure accurate data upon the following subjects:

The possible recovery of run-down ranges of different types, under partial and complete rest, and the rates at which recovery occurs.

The possibility of improving the native ranges artificially.

The carrying capacity of the ranges, present, normal and possible.

An estimate of the area and geographic distribution of the open range, with a summary of published topographic and climatic data relating thereto.

The chemical composition of and the botanical and economic data concerning the different species of range forage plants.

Range management with different kinds of stock with and without fence.

Several years ago an area of over 50 square miles of badly overstocked and depleted open range land, in southern Arizona, was set aside as an experimental range, and placed under the control of this office. The land was fenced and the greater part of it has been allowed to recover naturally. The remainder was divided into several pastures and has been carrying stock, mostly cattle, all the time.

Thus far this experimental range has demonstrated that a range, in southern Arizona, will recover approximately its normal carrying capacity, in three to five years, if allowed complete rest.

The hay-cutting operations and the collecting and weighing of the spring feed are beginning to furnish accurate data on the actual amount of feed per acre produced annually on the protected range. These data and those obtained from the records of stock actually carried on adjoining measured areas will give something definite as to the normal carrying capacity of this region.

The work in range management relates to the various methods of management of stock, particularly cattle and sheep, upon the native ranges of the arid region. Data as to the cost of various operations, the construction and care of machinery and equipment, methods of handling stock, causes of loss of stock, and methods of disposing of the output are collected and summarized.

The data are obtained from experienced stockmen in different parts of the country working under different range, climatic, and commercial conditions.

58 – Changes in the Manner of Farming in the Rhine Country, and their Causes.

BRINKMANN, TH. Veränderungen in der Betriebsweise der rheinischen Landwirtschaft und ihre Ursachen. — *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 19, pp. 625-643. Stuttgart, October 1, 1912.

The changes which the present time has wrought in agriculture bear chiefly upon the methods of farming; nevertheless they are far-reaching in their effects.

As for the changes in the farming of the Rhine country, the writer states that, according to a recent publication of the German Council of Agriculture, the wages of farm labourers during the last thirty years have increased on average by 100 per cent., and in the western provinces the increase has been still higher. On the other hand statistics show that the prices of machines and implements have sunk, not only in an absolute sense but also in relation to the improvement of their performance and durability.

Artificial manures, namely those containing phosphoric acid or nitrogen, have become much cheaper since 1880, as can be seen from the following table:

Period	1 lb. Phosphoric acid in superphosphate	1 lb. Nitrogen in nitrate of soda	1 cwt. of kainit containing 12.4 % of pure potash
1880-89	3.23*d*	9.60*d*	10.75*d*
1909	1.87*d*	6.15*d*	8.96*d*

The oscillations in the prices of concentrated foods are less uniform, some being cheaper and others dearer.

The prices of the means of production form one factor in the conditions of production, and the prices of agricultural produce the other. In this connection the writer gives the decade averages of the prices of the most important agricultural staples in Prussia proper, reaching back for nearly a century. The earliest part of this period, which is characterised by a continuous rise in prices, is here omitted, and in the following table only the prices of the last decade are shown, considering the prices of the period 1871 to 1880 equal to 100.

	Wheat	Rye	Oats	Straw	Hay	Potatoes	Beef	Veal	Pork	Prussian Smoked Bacon	Prussian Lard.	Butter
1901-10 . .	86	95	104	105	97	100	132	166	123	92	96	110
1911 . . .	89	95	111	109	106	161	146	187	119	92	96	120

In the next table the prices for the Rhine province are given ; those from 1901 to 1905 = 100.

	Wheat	Rye	Oats	Barley	Straw	Hay	Potatoes	Beef	Pork	Veal	Mutton
1906-10	121	120	116	119	103	101	112	114	111	116	117

The writer then considers the consumption of artificials, which is yearly increasing, in connection with the intensity of farming.

The following table in which the yearly consumption of pure potash (K_2O) in lb. per acre of cultivated area is given, affords an idea of the increased consumption.

	1890	1900	1910
Rhineland	0.27	1.58	6.88
Prussia	0.84	3.70	11.02

A further change in farming is brought about by the extraordinary increase in the price of labour and the consequent necessity of using labour-saving machines. In an extensive table the writer shows what changes have taken place during the last thirty years in farming in the Rhineland. It appears thus that machines are not only used in the large farms but also in the smallest, for in 1907 an average of 35 per cent. of the farms measuring from 5 to 12 ½ acres in extent, and nearly 6 per cent. of the smallest farms used large machines.

Changes on a large scale in the utilisation of the soil can only be perceived by examining a considerable period of time. The writer therefore collects data, for the period between 1878 and 1900, on the crops raised, arranged according to their destination. They are divided into five groups, and the percentage of the whole cultivated area that each occupies is given. The most striking changes in the areas devoted to the various crops are the following: The groups of purely forage plants and of those with a twofold destination have both gained ground, while since 1893 the area devoted to wheat has considerably diminished in all the districts. Similarly spring wheat and barley have lost ground, barley losing almost a quarter of its original area. Oats have sustained their price best of all. Oat straw has gained in importance as fodder, which is explained by the greater use of concentrateds together with straw, and especially oat straw, in the feeding of stock.

Very interesting also are the results of a table, drawn up by the writer, which shows how the extent of live stock rearing has changed during the last thirty years in the various classes of farms, grouped according to acreage. They prove, in accordance with what may be daily observed, that the amount of cattle kept by the smallest farms has everywhere diminished. On the other hand, they show that the small peasant farmers present already the greatest increase in their stock of cattle and that with the increased acreage of the farm both the amount of cattle and its increase from 1883 to 1907 grow less and less. Similarly in pig keeping, only that here the difference consists in the fact that the smallest farms take the lead considerably ahead of all the others, especially in the thickly populated Düsseldorf district.

The last thirty years have witnessed an extraordinary increase in the quantity of live stock kept, but it must be recognized that this increase has gradually declined; in fact, in its most important branch, namely cattle, the maximum has been passed, for since 1907 a backward movement has set in, nearly the same in all districts.

Though it is a fact that the profit on live stock has somewhat diminished during the last few years, the writer believes that the future prices of animal produce will be favourable to the farmer.

The difference in the consumption of meat and milk, which according to statistics still exists between the several parts of the country, between town and country, between large and small towns, and between the several classes of the population according to their degree of prosperity, lead to the conviction that if there is a branch of farming which holds out prospects of greater profits, it is the keeping of live stock for the production of meat and of milk.

59 – The Remedies for Rural Depopulation in Great Britain.

STRUTT, HON. EDWARD GERALD, President of the Surveyors' Institute. Opening Address read at the ordinary General Meeting of the Surveyors' Institute, on November 11th, 1912. — *Transactions of the Surveyors Institute*, Session 1912-1913, Vol. XLV, Part I, pp. 1-42. London, November 11th, 1912.

One of the great questions now agitating the people of Great Britain is the decline of the agricultural population.

The following figures showing the people engaged in agriculture in England and Wales between 1881 and 1901 will illustrate the importance of this subject.

Date	Farmers and Graziers	Agricultural Labourers including Shepherds and Carters	Totals
1851	249 431	1 376 051	1 625 482
1861	249 735	1 296 805	1 546 540
1871	249 907	1 073 084	1 322 991
1881	223 943	965 217	1 189 160
1891	223 610	866 034	1 089 644
1901	224 299	727 140	951 439

One of the most unsatisfactory features of the agricultural statistics is the continually increasing area of pasture land and the decrease in arable. The loss of 2 000 000 acres of arable land in Great Britain in the twenty years 1881-1901 probably threw out of work from 60 000 to 80 000 labourers at least during that period. The number of acres withdrawn from the plough since 1901 is about 942 000, making a decrease in arable land in thirty years of nearly 3 000 000 acres. It would therefore appear that one of the most effective ways of increasing the agricultural population would be to reconvert a considerable portion of these inferior pasture lands to their original use, which is that for which they are best fitted.

During the last eighteen years, on an estate in which the writer is interested in the east of England, careful field accounts have been kept of the expenses and receipts both on pasture and arable land, and certainly some striking results are shown which contradict the fashionable theory of writers on agriculture that corn growing is unprofitable, and that the farmer must now look entirely to his stock if he wishes to succeed in his venture.

These accounts represent two farms of roughly 2 000 acres, of which about three-fifths are arable land and two-fifths pasture.

Table I summarizes the net financial results per acre over 1) the whole eighteen years; 2) the first twelve years and 3) the last six years. The average profit per acre shown has been arrived at after charging all expenses, including rent, rates and taxes, but excluding interest on capital.

	Eighteen Years: Period 1894-1911				Twelve Years: Period 1894-1905				Six Years: Period 1906-1911			
	Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre			Total number Acres	Average Profit per Acre		
		£	s.	d.		£	s.	d.		£	s.	d.
Wheat	4 093	2	18	8	2 358 ½	2	5	2	1 734 ½	3	17	0
Barley	3 603 ½	2	3	4	2 480	2	1	4	1 123 ½	2	7	9
Winter Oats	1 980 ½	2	18	6	1 238 ½	2	17	6	742	3	0	1
Spring Oats	1 357 ½	2	1	7	740 ½	1	19	2	617	2	4	8
Beans	521	1	5	1	354	1	1	11	167	1	11	11
Peas	595 ½	0	19	11	389 ½	— 0	3	2	206	3	3	8
Swede and Mangold Seed	546	2	5	5	485 ½	2	8	9	60 ½	0	18	6
Red Clover	2 084 ½	2	11	6	1 288	2	9	9	796 ½	2	14	4
Sanfoin	785	1	9	6	695 ½	1	8	9	89 ½	1	14	8
Lucerne	726 ½	1	5	4	544 ½	1	6	7	182	1	1	3
Rye, Tares, Trifolium	526	0	6	3	337	0	7	9	189	0	3	7
Mangolds	2 656 ½	0	18	2	1 668 ½	0	10	0	988	1	12	5
Potatoes	515 ½	4	13	1	113 ½	— 0	12	4	402	6	2	9
Cabbage, Kohl Rabi, etc.	703	— 0	2	8	505 ½	— 0	4	0	197 ½	0	0	2
Maize	275	1	4	10	236 ½	1	4	0	38 ½	1	6	6
Permanent Grassland	13 514 ½	0	7	11	9 133 ½	0	8	7	4 381	0	6	6

Note: Losses are shown by — (minus).

The following figures show the results of stock-keeping on the same area of land:

	18 Years 1894-1911 Annual Profit			12 Years 1894-1905 Annual Profit			6 Years 1906-1911 Annual Profit		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Cows	801	0	6	716	0	0	972	0	0
Cattle	— 32	0	0	— 75	0	0	54	0	0
Pigs	— 11	0	0	— 1	0	0	— 31	0	0
Sheep	— 14	0	0	— 32	0	0	22	0	0
Poultry	143	0	0	159	9	3	111	0	0
Total Profit	887	0	0	767	9	3	1128	0	0

Note: Losses are shown by — (minus).

It will be observed that the cows and poultry after being charged with every expense have been profitable to the farm.

The net annual profit from the arable land over the whole eighteen years has been £2 1*s* 7*d* per acre, and from the grass land during the same period 7*s.* 11*d.*

Dividing the period into two portions, taking the first twelve and the last six years — the second period representing somewhat the recent agricultural revival — the net profit during the first twelve years from the arable land was £1 14*s.* 3*d.* per acre and from the grass land 8*s.* 7*d.*

During the last six years, with the prices of all agricultural produce increased, results from the arable land were £2 14*s* 9*d* per acre and from grass land 6*s.* 6*d.*

It is specially interesting to note that the wheat crop grown in the dry climate of the east of England has proved the most profitable, and it would seem to be possible if the prices of the last six years should be maintained, that a far larger area of wheat might be grown than is now the case. A very interesting paper on this subject was recently read by Mr Christopher Turnor, who believes that Great Britain could produce at a profit one-half the wheat consumed instead of one-fifth as at present.

The above figures and those given on Table I show that corn crops generally have on the whole paid their way satisfactorily, and if the alternative cultivation could be made equally profitable, the arable farming would be a farirly successful venture.

As far as the problem of increasing the number of small holders is concerned, the writer is of the opinion that any attempt to augment the number of small-holding tenancies should be carried out under a definite and carefully thought-out scheme, the small holders being placed in positions where they could conduct successfully the special industries with which the small farmer has an advantage over his larger neighbour. The districts selected should be those with market facilities, where small holders already exist, or where the soil, climatic and transit conditions are favourable for the growth of special crops requiring the interested and careful attention of the cultivator. The growth of intensive crops would also assist in maintaining a larger agricultural population, and in this connection the following table, showing the acreage under small fruit, apart from orchards, in 1900 and 1911 is noticeable, the percentage of increase being large:

Year	England	Wales	Scotland	Total
1900	66 749	1109	5922	73 780
1911	76 287	902	7119	84 308

To turn to another intensive crop, the acreage of hops in England in 1911 was 33 056 acres, the total ten years previously being 51 127 acres and 56 145 in 1891. It will be observed that there was a large reduction during the ten years 1901 to 1911. The cost of cultivation is so large that hops can be grown only by capitalists who can stand the variations of good and bad seasons and who are prepared to take every advantage of the latest scientific knowledge. It is nevertheless an industry which directly employs a great deal of labour, costing, it is estimated, at least £18 per acre, and if it could profitably be extended where the land is suitable, it would provide a large amount of additional work for the agricultural population. Another crop requiring a large amount of labour, and about which a good deal has been said during the last few years, is sugar beet. The importance of the introduction of the growth of sugar beet in England cannot be overrated, for if a good alternative crop could be grown which would pay a fair profit, and at the same time clean the land, it would remove many of the agricultural difficulties now existing. All possible support and encouragement should be given to pioneers of this industry, realising that if they succeed in their undertaking they will have rendered a great service to British agriculture.

There are many other ways in which an enlightened Government might assist the prosperity of agriculture and so preserve a larger population on the land. The practical instruction in the case of the small holder seems to be of primary importance; proper and convenient means of cheap transit must also be provided by an extension of light railways and of systems of motor lorries in connection with the great railways or the centres of population.

An extension of forestry is also proposed by many as a means of increasing the country population, but it is difficult to see how planting on land of fair value could be made a commercial success, though possibly as a form of compulsory saving to individual landowners it might have advantages.

And lastly, though certainly not occupying that position in importance, there is the question of rural housing. In this respect it might become advisable to follow the example of Ireland under the Labourers Acts. There the district councils formulate schemes for the erection of horses and securing garden plots in accordance with the requirements of their districts, the Local Government Board being the department responsible for holding local inquiry into any schemes put forward and for sanctioning them if satisfied that they are reasonable.

If a scheme is sanctioned, the necessary capital is advanced by the Land Commission repayable in 68½ years by equal payments. The interest is 3.5. per cent — 2 ¾ per cent. representing interest and ½ per cent. sinking fund. The number of houses authorised to the 31st March 1912 was roughly 49 000, of which 40 000 have been built and occupied, and 9 000 are in process of erection. Parliament voted £5 250 000 altogether in connection with these Acts, and it has been earmarked for housing purposes.

Whatever may be done, either in the directions indicated by the writer or in others, it is essential, if the rural population is to be increased, that the cultivation of the soil should be a paying business. The English cultivator has to compete with all parts of the world, and no undue burden theretore should be placed on his industry.

A wise Government should give him every assistance possible, particular care being taken to encourage the expenditure of capital on the land, and so far as possible to assure to all those engaged in the industry a reasonable reward for their enterprise.

The writer closes his address with some considerations concerning the breaking up of large estates, which is the noticeable feature of the present day and expresses the opinion that the same has probably two main causes: the chief one, the Finance Act of 1910, and the increase of death duties, which press with peculiar severity on agricultural estates, together with the promise of further legislation which may be antagonistic to the landowning class.

AGRICULTURAL INDUSTRIES.

DAIRYING

60 - The Importance of Infectious Catarrh of the Vagina in the Control of Milk.

MESSNER, AND KOHN, F. G. Die Bedeutung des infektiösen Scheidenkatarrhs für die Milchkontrolle. — *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 5, pp. 99-104. Berlin, December 1, 1912.

Not only diseases affecting the lacteal glands themselves bring about great changes in the milk, but these alterations are also induced by the diseases usually accompanied by high fever which attack milch cows.

In epidemics of these diseases, milk control entails, not only taking measures to protect human beings and animals from infection, but ascertaining whether the normal physical and chemical composition of the milk has suffered in any way, for only by such means can it be determined whether perhaps some of these changes are due to want of cleanliness in the handling of the milk.

The writers have examined to this end the milk of cows suffering from infectious catarrh of the vagina. To ensure accuracy in the comparison, the milk of the healthy cows inhabiting the infected shed was also examined.

The tests were usually made midday and evening, and the following points were noted.

1. The breed or family of the milch cow.
2. The age of the animal.
3. Duration of lactation period.
4. Milk yield.
5. Condition of health.

The following data were obtained from the examination.

1. The specific gravity, by means of lacto-densimeters.
2. The fat content (using Gerber's sulphuric acid method).
3. The dry matter, reckoned according to Fleischmann's formula.
4. Solids not fat.
5. The refractive index of the milk serum (Ackermann's method).

The milk of 105 cows in 29 sheds was investigated, and 40 of these animals were healthy, 65 diseased; 56 were attacked by chronic catarrh of the vagina, but only 9 had the disease in the acute form.

The appearance of the milk is unchanged and it is only on examining the averages that the difference is clearly seen. The milk yield decreases, the fat content rises, the amount of solids not fat diminishes and the refraction index is lower; but all these changes are only distinctly noticeable when the milk of diseased and healthy cows is compared at the same stage of the lactation period.

For this purpose, the writers compared the averages obtained from the examination of the milk from 8 healthy cows and from 9 animals suffering from the acute form of the disease:

	Healthy	Diseased	Difference
Total milk yield	2.53	1.80	— 0.73
Specific gravity	1.0330	1.0312	— 0.0018
Fat content . .	3.5	4.3	+ 0.8
Solids not fat .	9.21	8.90	— 0.31
Refractive index	40.2	39.4	— 0.8

The deficiency in the milk yield of recently infected animals was 30 per cent., in the case of chronically diseased cows it was about 13 per cent., *i. e.* sufficient to be of economic importance.

The following is a summary of the facts:

1. The milk of cows suffering from infectious catarrh of the vagina shows on an average a decrease in specific gravity and in solids not fat

content and a lower refractive index, but on the other hand, the fat content is increased.

2. Thus this milk would be passed as excellent in quality, unless the data obtained by its examination were compared with those referring to the product of healthy cows.

3. It appears, from the data obtained, that a change in the methods hitherto adopted for milk control is not necessary if all the characters of milk are considered together.

61 - A Quick Method of detecting Water in Buttermilk.

HÖYBERG, H. M. Ein schnelles Verfahren zur Bestimmung des Zusatzes von Wasser in Buttermilch. — *Zeitschrift für Fleisch- und Milch-hygiene*, Year XXIII, Part 5, pp. 104-107. Berlin, December, 1912.

Hitherto, it has not been very easy to determine whether water has been added to buttermilk or not, especially when it was impossible to prove the presence of nitrate, the latter substance being absent from some waters; further, it may be introduced by the water used for washing.

Therefore in legal proceedings the only method at present employed for judging the purity of the buttermilk is the determination of the solids-not-fat content, for the fat content is too variable to be used for this purpose. The writer proves by his experiments that the solids-not-fat content of buttermilk often sinks below the usually accepted minimum amount without any addition of water, while it often remains higher even when water is added. Also, from the solids-not-fat content it is impossible to determine the quantity of water present.

Another more accurate method of determination must therefore be adopted. Such, for instance, as estimating the specific weight of the butter milk and whey.

As the thick consistency of the former prevents its specific weight being determined in the usual manner by an areometer, the writer obtained it from the whey contained in the buttermilk.

He heated ½ litre of buttermilk to 50° C., pressed the buttermilk through a piece of thick linen, and cooled it to 15° C. He then determined the specific weight in 112 experiments by means of an areometer and obtained the following data.

The whey of unadulterated buttermilk has a specific gravity of from 1.0250 to 1.0275.

If the specific gravity of the whey is below 1.0250, the buttermilk may be regarded as adulterated with water.

Further, the ratio between the specific gravity and the amount of water added remains constant, *i. e.* the specific gravity falls on an average 0.0010 with every 5 per cent, addition of water; thus this method affords a means of determining with some accuracy the amount of water which has been introduced. In this way, adulteration in buttermilk samples can be quickly, easily, and sufficiently accurately detected.

In conclusion, the writer remarks that it is necessary to distinguish between direct and indirect watering of the buttermilk; the latter occurs from steam being passed through, or if ice is added to the cream in order to cool it.

Further, water may be introduced if the milk utensils, *e. g.* the cooling apparatus, are not water-tight.

62 – A Study of the Gases of Emmental Cheese.

CLARK, WILLIAM MANSFIELD: *U. S. Department of Agriculture, Bureau of Animal Industry*. Bulletin 151. September 7, 1912.

The writer aims at ascertaining by means of exhaustive experiment the nature of the gases present in the so called " eyes " in Emmental cheese, and of those which cause the formation of these cavities. He succeeded, by means of apparatus devised by himself, not only in collecting the gases in the eyes, but also those in the " pinholes ". These he subjected to qualitative and quantitative analysis.

In normal eyes, the gases consisted of carbon dioxide and nitrogen with traces of oxygen and hydrogen. Spectroscopical investigation also showed that hydrogen can play no part in the eye formation, as no significant amount of hydrogen was found, and it was proved that this gas had not escaped detection from its rapid diffusion out of the body of the cheese. The production of hydrogen was however very active while the cheese was in press, and small percentages of this gas generally accompanied abnormal eyes. This is probably due to a slight initial gaseous fermentation of the sugar. It has, however, been shown, that all traces of sugar have disappeared by the time of the formation of normal eyes, and further, that sugar fermentation and the formation of hydrogen have nothing to do with the production of these cavities. In the ripening process of the cheese, therefore, two types of gas formation are to be distinguished. The one is highly detrimental and is accompanied by hydrogen, while the other is demanded in a good Emmental cheese. One is dependent upon the presence of sugar, the other occurs in the absence of sugar.

With regard to the oxygen, the writer found that a large amount of this gas was absorbed by the cheese, but only small traces of it were found in the cavities. Oxygen is also absorbed from the air which penetrates the cheese, but the nitrogen remains in the eyes.

Emmental cheese has a low permeability for air and for gases in general, especially when it is dry. Only a small amount of air can penetrate into the cheese, and since the oxygen contained in this small quantity of air is absorbed, it follows that the conditions in the interior of the cheese are eminently favourable to the development of anaerobic bacteria.

The nitrogen which is found in the mixture of gases in the eyes is also partly derived from the air which penetrated the cheese, but mostly, as was proved by experiment, from that contained by the curd. It can, however, be considered certain that no free nitrogen arises in the formation of the eyes.

Only carbon dioxide plays an important part in the formation of these cavities and forms the greatest part of the mixture of gases contained in the latter. Von Freudenreich and Jensen considered that the formation of carbon-dioxide in the eyes was due to the activity of propionic bacteria, but the writer proved mathematically and practically that the action of these micro-organisms is not sufficient to account for the large amount of carbon dioxide which is formed during the ripening of the cheeses, for the whole amount of the gases formed not only occurs in the cavities but also saturates the body of the cheese. Further, a large increase in the formation of carbon dioxide takes place if the cheese is manipulated with sterilized instruments.

If the bacteria are indeed concerned in the production of carbon dioxide, the question still remains whether they are sufficiently localised to cause the eyes. The writer suggests that there are two phases in the formation of normal eyes, a saturation of the body with carbon dioxide, and an inflation of the eyes. He allows that the part played by anaerobic bacteria in gas production is an important one, but leaves it an open question whether their action in the formation of eyes is primary or secondary. The writer notes in this connection that a number of cheeses made with artificial rennet, which did not contain propionic acid bacteria, began a normal eye formation, but as this beginning seldon developed into normal holing, he asks if it is not possible that the reaction which started the eye formation was rendered inadequate because the gas-producing propionic bacteria, which might have saturated the cheese with carbon dioxide, were absent. He is, however, of opinion that exhaustive research and the qualitative and quantitative investigation of the gases at every phase of cheese-ripening can alone solve the question.

WOOL INDUSTRY

63 - Insects Infesting Woollen Tops.

FROGGATT, WALTER W. — *The Agricultural Gazette of New South Wales*, Vol. XXIII, Parts 6 and 10, pp. 491-492 and 900 + 1 plate. Sydney, June and October, 1912.

In the first of these articles the writer ascribes the injury done to a package of woollen tops, which had been shipped from New South Wales to Japan, to a cosmopolitan carnivorous species of the *Cleridae*, *Necrobia rufipes*, called the "Red-legged Ham Beetle" in England, because it feeds upon ham, etc.; in the Islands it is known as the "Copra Bug", as it devours dry coconut kernels. This insect was determined by the writer from specimens of infested tops sent to him from Japan.

After the publication of his account, several authorities among the shipping people observed that the woollen tops were destroyed, not by the "Copra Bug," but by a weevil. In a second lot of samples of tops sent from Japan, the writer discovered other larvae different from those which had been present in the first consignment; these proved to be the larvæ of *Dermestes cadaverinus* ("Cosmopolitan Skin Weevil"). This destructive insect is plentiful in sheep-breeding centres and in hide and skin stores. *Dermestes cadaverinus* occurs most commonly in ships which trade between Australia and the Far East. It is not only necessary to fumigate the holds of such vessels as carry hides, skins and bones, but further, all the loose fittings should be examined and removed if infested with these insects.

WINE-MAKING

64 – "Vin de Goutte" and "Vin de Marc".

ROOS, L. Vin de Goutte et Vin de Marc. — *Annales des Falsifications*, 5th Year, No. 49, pp. 509-517. Paris, November 1912.

The writer gives the name of "vin de goutte" to the wine which flows by itself from the grapes, whether the latter are crushed or not, while "vin de marc" is that which remains in the solid particles of the fruit after draining and which is extracted, either by pressure before or after fermentation, or by diffusion after fermentation alone.

There is a great difference in composition between these two kinds of wine made from the same vintage, and notably in the alcohol content, which might lead to the suspicion of adulteration. The method of wine-making used, the system, or the completeness of the crushing, the development of the mechanical apparatus attached to the crusher for separating the juice or removing the stalks, the submerged or the floating pomace systems of fermentation, and the degree of the ripeness of the grapes, are all factors in determining the differences, which are often great, between the "vins de goutte" and "vins de marc" from the same vintage, *i. e.* between the "vins de goutte" and those which are, later on, pressure wines or diffusion wines according to the process employed for exhausting the pomace.

M. Bouffard has already obtained, by means of laboratory experiments, a difference of 0.6 between the average degrees of two pressure wines from the same vintage, of which part was thoroughly, and the other only half crushed.

The writer has observed numerous cases where "vins de marc" resulting from the method of mixed wine-making, by which it is proposed to make from the same vintage and at the same time, white or rose-coloured and red wine, have an alcohol content 2 or 3 per cent lower than that of the "vins de goutte". If the different parts of the grape are examined, it will be seen that the decrease in alcohol is due to the vegetation water of the fruit occurring in part of the grape only. According to M. Girard and Lindet 1000 kg. of Aramon grapes furnish:

Grape stalks	40.7 kg.
Berries	959.3 »

The percentage composition of the grapes is as follows:

Pulp	88,81
Skins	9.45
Pips	1.74

These figures, if applied to 959.3 kg. of grapes, give for 1000 kg. of a complete vintage :

Stalks	40.70 kg.
Pulp.	851.95 »
Skins	90.65 »
Pips	15.69 »

The 851.95 kg. (1874.29 lbs) of pulp, of a density above unity, correspond to 800 litres(176 gallons) of juice. Thus, if from such a vintage when crushed, on the first operation 500 litres (110 gals.) of juice are obtained, there still remain 300 (66 gals.) in contact with the solid parts of the fruit forming the pomace of this first pressing. The composition of these portions is as follows, according to the same analysis of M. Girard and Lindet.

The percentage composition of the Aramon skins is considered to be :

Water	76.80
Other substances.	23.20

It should be noticed that the other substances, summarized at 23.20, do not include sugar. The percentage composition of the pips, which do not contain sugar, is :

Water	34.82
Other substances.	65.18

That of the stalks, also without sugar, is :

Water	79.66
Other substances.	20.34

After complete fermentation, lasting long enough to allow of cellular interchanges, and finally of the pomace becoming impregnated with a homogeneous liquid, all the vegetation water of the skins, pips, and stalks unites with the remaining 300 litres (66 gals) of juice.

Thus the amount of water would be for the 1000 kg of the grapes under consideration :

For the skins . . . . 90.65 × 0.768 = 69.62 kg.
» » pips . . . . 15.69 × 0.348 = 5.46 »
» » stalks . . . 40.7 × 0.796 = 32.42 »
Total . . . 107.50 kg.

The 300 litres of fermenting juice are thus united, by means of intercellular exchanges, to the 107.300 litres of water to form a homogeneous whole. If also the amount of sugar present is as allowed for by MM. Girard and Lindet — 14.09 per cent. of the pulp weight — the juice in question would contain 150 gr. per litre, capable of giving a " vin de goutte " of $\frac{150}{17.5} = 8.57$ per cent.

The liquid impregnating the pomace consists of: 300 litres of juice at 15 per cent. of sugar, plus 107 litres of water of vegetation from the different organs, and will only be capable of furnishing 3×8.57 of alcohol, or 25.71, which, divided between 407 litres, gives an alcohol content of 6.61 per cent.

In this case, the " vin de goutte " extracted for white wine will show a difference of 1.96 per cent of alcohol in favour of white " vin de goutte " compared with red " vin de goutte ", whether obtained by pressure or by diffusion.

This coincides with what is often found in practice, and even the difference between " vins de marc " and " vins de goutte " may be still more accentuated, if instead of limiting the extraction to 500 litres per 1000 kg., it is extended to 550 or 600 litres, or even more.

The method and the completeness of the crushing, or still more of the removal of the stalks, causes great differences in the composition of the pomace and thus in that of " vins de marc ". The result of perfect crushing, whether performed by the crusher alone, or by crushing followed by different mechanical operations, is to remove the pulp entirely from the berries and thus to make the pomace much poorer in sugar, as the latter substance is derived only from the adherent pulp, and is also much lighter. This difference of composition and of density has a notable influence upon the quality of red " vins de marc " according to the fermentation method adopted.

These differences are attenuated by the separation of the stalks, as this operation removes from 2 to 5 per cent. of the water of vegetation.

If the submerged-pomace fermentation system is used, whatever the state of the grapes which are crushed, there is no difference between " vin de goutte " and " vin de marc ". For all the water of vegetation is found in the mass, the intercellular exchanges take place during the whole fermentation period, and this water of vegetation is distributed throughout the liquid, especially if the liquid has been well mixed during the fermentation process. If, however, it is a question of floating-pomace fermentation, differences occur, and these vary according to whether the crushing has been complete, or not, whether the fermentation, always with floating pomace, is carried out in tuns, or in vats with vertical sides; whether or not the mixing by drawing liquid from the bottom of the vessel and pouring it in at the top during fermentation, has been practised or not, and also according to the ripeness of the grapes.

Tha shape of the vessels, tuns or vats, may be of importance, in so far as it hinders or allows the rising of the pomace and the formation of the " cap ".

In tuns, which are normally full, the submerged portion of the pomace is always larger, approaching nearly to the submerged-pomace type of fermentation. The difference betwen " vins de goutte " and " vins de marc " would be very slight and often almost nil, if it were a question of a not completely ripe vintage, which has undergone a merely rudimentary pressing; the " vins de marc ", whether obtained by pressure or diffusion, are *more alcoholic* than the " vins de goutte ". This is explained by the fact that the accumulation of sugar in the grape proceeds from the periphery to the centre during the ripening. Also, if it is a question of a vintage which has been little crushed, it is just the poorest part of the pulp which is expelled: and this forms the " vin de goutte ". The pulp which adheres to the skins may be much richer in sugar, and able to more than counteract the influence of the water of vegetation contained in the fruit.

When fermentation takes place in vats with vertical sides, or in partially filled tuns, the immersion of the pomace may be very variable, and the difference between " vin de goutte " and " vin de marc " will be increased with the completeness of pressing, the pomace being lighter and the immersion least. This difference will also be augmented by the fermentation being shorter after the formation of the pomace cap, as the immersion increases till, in time, it is complete ; and also by the greater ripeness of the vintage, for when the grapes are quite ripe, the pulp adhering to the residuum is no richer in sugar then that which forms " vin de goutte ".

In vats and tuns alike it may also happen in the case of unripe, little-crushed grapes, that the " vin de marc " is richer than the " vin de goutte ".

These are undeniable facts and relatively newly discovered, as they could not be observed while wine-making methods and apparatus were primitive. But, whatever decrease there may be in alcohol content, " vins de marc ", whether the result of pressing or diffusion, should not present the habitual characteristics of watering. In fact, if the skins, stalks and pomace bring sufficient water of vegetation to cause a diminution in the alcohol content, they also supply soluble acid and neutral compounds, which enter into the composition of the wine and give it normal analytic characters.

**THER
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65 - Peanut Butter.

BEATTIE, W. R. — *U. S. Department of Agriculture, Bureau of Plant Industry,* Circular No. 98, 14 pp. Washington, October, 1912.

In the United States several large factories and a number of smaller ones are now devoted to the manufacture of peanut butter with which to supply the rapidly increasing demand. Some of the larger factories are almost models in their construction, equipment and management, while many of the smaller establishments which have no elaborate equipment, are turning out an excellent product.

Peanut butter consists merely of fresh roasted peanuts ground fine and salted. It is calculated that in 1911 about 1000 railway cars of shelled peanuts, or 1 000 000 bushels, were used in the manufacture of this food.

In order to produce high class peanut butter the best of materials and the utmost cleanliness are necessarry; consequently it should never be prepared in premises attached or adjacent to a peanut cleaning establishment, on account of the dust.

In the United States two distinct types of peanut are grown, the Virginia or Jumbo (including the varieties known as Virginia Bunch, Virginia Runner, and North Carolina or Wilmington) and the Spanish type (including the true Spanish, Georgia Red, Tennessee Red, and Valencia).

Three grades of shelled goods of both types are prepared. In each case No. 1 consists of whole kernels, No. 2 of split kernels and No. 3 of the finely broken and badly shrivelled ones. The use of the latter in the manufacture of the butter should be discontinued. The best grade of the Spanish and Valencia and the cheaper grades of the Virginia type of peanuts are commonly employed for the production of peanut butter. An admixture of the Spanish peanuts gives the product a greater degree of smoothnss, but butter made from Spanish peanuts alone contains too much oil. The writer suggests the posssibility of using them after having extracted from them 8 to 10 per cent. of the oil by pressing. Peanut butter of the proper consistency contains 41 or 42 per cent. of fat.

The successive manipulations that the peanuts are submitted to for the preparation of the butter are the following:

1. Roasting at about 160° C. for 30 to 35 minutes.
2. Rapid cooling by a cold air blast.
3. Blanching, that is removal of the outer red skins and the germs. This is accomplished by means of blanching machines consisting of a set of brushes revolving against a corrugated plate.
4. Hand picking for the removal of small pebbles, discoloured or inferior nuts, etc.
5. Blending of the different kinds of peanuts used.
6. Salting with 1 ½ to 3 per cent. in weight of salt.
7. Grinding to a fine granular form.
8. Bottling and packing.

The writer describes with full particulars each of the above operations as well as the necessary plant, and gives illustrations of some of the model factories.

PLANT DISEASES.

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

66 – **Royal Decree of Nov. 8, 1912, regarding the Regulations for the Creation of a Phytopathological Service in Belgium.**

Arrête royal du 8 Nov. 1912, portant règlement concernant la création du Service phytopathologique spécial, l'inspection des cultures horticoles et des pépinières, ainsi que l'importation et l'exportation des produits de ces cultures et plantations.—*Moniteur Belge*, Year 82, No. 322, pp. 7458-7464. Bruxelles, Nov. 17, 1912.

Article 12 of the rural code, amended by the law of June 27, 1912, is formulated in the following terms:

"The measures to be adopted for the destruction of caterpillars and insects and for the uprooting of thistles and the destruction of injurious plants, are determined by Royal Decrees. Those which have for their object the prevention of the introduction into the country or of the propagation of insects or other animals, or of cryptogams and other plants, which are injurious to crops, are likewise regulated by Royal Decrees."

For the execution of this law, a decree was passed on Nov. 8, 1912, as follows:

§ 1. *Special service of phytopathological inspection.* — An inspector is entrusted with the direction and scientific control of the special service of phytopathological inspection. Assistant experts are appointed to aid the inspector in drawing up the necessary certificates for the dispatch of horticultural plants abroad. (Art. 1).

All matters of the special service of inspection, both in the interior of the country, or on the frontiers, are regulated by Ministerial Decrees (Art. 2).

Every owner or tenant who cultivates or keeps horticultural or nursery plants under glass or otherwise, is obliged to permit the grounds to be visited by the inspector of the special service of inspection, or by the experts mentioned in Art. 1. All dealers in the plants under supervision are required to allow the contents of the parcels of plants for export to be examined at any time (Art. 3).

§ 2. *Transit.* Art. 4. — "Plants imported for transit are subject only to the conditions prescribed by Art. 6 of the Royal Decree of Sept. 15, 1885, for the execution in Belgium of the regulations of the International Phylloxera Convention."

Art. 5. — " Independently of the formalities prescribed by the Royal Decree mentioned in the preceding article, the exportation and importation of the plants referred to in Art. 3 are regulated by the following provisions. "

§ 3. *Importation.* Art. 6. — " The importation of horticultural or nursery plants attacked by insects or plants imjurious to crops is forbidden. "

Art. 7. — " The Minister may order the return of such plants, or restrict their importation to certain Customs Offices named by him with the common consent of the Minister of Finance. "

Art. 8. — " In certain serious cases, he may forbid the entry of certain species or varieties of the said plants coming from the countries he names."

" In default of taking this measure, he can order the production of certificates to the effect that the plants presented for import come from cultivations free from injurious insects or plants, and that the plants sent are free from such insects or plants."

" The examination of the plants sent can take place at the frontier, or on arrival. "

Art. 9. — " In cases where the plants dispatched to the interior of the country are recognized as being attacked by injurious insects or plants, the Minister has the right to decree their destruction at the cost of the importer, who is not entitled to any indemnity. "

§ 4. *Exportation.* Art. 10. — " No horticultural or nursery plants may be sent to foreign countries, unless they have been certified as entirely free from injurious plants and insects by the Inspection Service organized according to Art. 1.

Art. 11. " The grower, whatever his status, of such a cultivation of plants as is mentioned in Art. 3, where the special Inspection Service testifies to the presence of an insect or plant, which it recognizes as harmful to plantations, is held responsible for its destruction. "

" Until the destruction of the injurious insect or plant is effected, the Inspector of the Special Service is required to refuse the phytopathological inspection certificate mentioned in Arts. 14 and 15. "

Art. 12. — " All plants destined for the United States, or for any other country determined by the Minister, have, before exportation, to be provided with a certificate to the effect that they come from sources free from plants and insects injurious to cultivations. "

" Such goods as do not comply with this regulation, cannot be admitted for transport ".

" When the plants sent have not all been grown by the sender, the latter is required, under penalty of the application of Art. 17, to assure himself in every case that the other plants also come from sources which have also been certified by the special Service as free from injurious plants and insects. To this end, the sender has a right to demand the production of the inspection certificate which the grower has received ".

Art. 13. — " In special cases, the Service Inspector can, on condition that the persons interested conform to his instructions, give permission to send plants exported directly from abroad together with the products of cultivations which have conformed with the provisions of Art. 10 ".

Art. 14. — " The Certificate mentioned in Art. 12 is granted by the Inspector of the Special Service. Its granting depends upon an inspection certificate drawn up by the said Service and affirming that the cultivations have conformed with the regulations contained in Art. 10 ".

" The Minister fixes the time for which this certificate is valid ".

Art 15. — " The inspection certificate can be obtained gratuitously by every grower of horticultural plants on application to the Inspector of the Special Service and on observing the conditions laid down by the Minister ".

Art. 16. — " At certain times, which are fixed by ministerial decree, the Inspector of the Special Service, aided by assistant experts, inspects the cultivations of the persons making the declarations and carries out the necessary investigations ".

" When the cultivations can be considered free from injurious plants and insects, the Inspector of the Special Service grants the inspection certificate ".

" The latter is refused, when, among the inspected places, plants are found attacked by injurious insects or plants ".

Art. 17. — " The inspection certificate is refused, or withdrawn, in the case of the non-observance of part 3 of article 12, or when the cultivator of the cultivations to be inspected only determines these partially, or does not render the Special Service Inspector the necessary assistance to enable him to carry out the requisite investigations ".

" Such refusals are announced to the Minister by the Inspector of the Special Service within three days. The same procedure is observed in the case of a refusal of the certificate based on part 3 of the preceding article ".

The last § deals with the research of the infringements of the regulations and the penalties incurred by non-compliance.

A ministerial decree of Nov. 9, 1912, regulates the inspection of horticultural and nursery cultivations; to this is appended a circular, addressed to the Governors of the Provinces, dealing with the above decrees.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

67 - On the Effect of Falls of Temperature on Vines, in Connection with " Bramble-leaf " (1).

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

PETRI, L. Ricerche sulle cause dei deperimenti delle viti in Sicilia.

I. — Contributo allo studio dell'azione degli abbassamenti di temperatura sulle viti in rapporto all'« arricciamento », 210 pp., 97 figs. Roma, 1912.

According to the writer certain solid endocellular fibres are constantly found in the tissues of all those vines in Sicily or on the mainland which are sickly in consequence of the attacks of "bramble-leaf" or "roncet". These fibres are found both in American and European stocks, and in the grafted as well as in the ungrafted vines, and mostly in the above ground parts of the plants.

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(1) See also No. 1349, *B.* Sept. 1912. (*Ed.*)

These formations are identical with those already well known in the wood of conifers ("Balken" of Sanio). These endocellular fibres are not formed in vines affected by other forms of distortion. Their formation precedes the exterior manifestations of bramble-leaf, and similarly to these, they are transmitted by cuttings; their formation is caused by falls of temperature during the growth of the plant.

The distortion of the shoots produced directly by late frosts is not the same, morphologically or genetically, as that produced by bramble-leaf. The action of cold, necessary for the formation of these fibres, does not produce directly distortion of the shoots. The sensibility of the cambium and of the other tissues to this particular action of the cold increases after they have once been injured.

The process of the formation of the fibres may be considered as the consequence of the deviation of a normal process which takes place during mitosis under the influence of the fall in temperature. This perturbation lasts, and is transmitted also to the cells which originate from those first injured, independently of a repetition of the cold.

Those conditions of structure of the soil and of aspect of the vineyard which usually favour the ordinary ill effects of cold, and which have been found to further the appearance of bramble-leaf, may be considered as predisposing and perhaps complementary factors in the special action of cold in forming the endocellular fibres.

It is very probable that the manifestations of bramble-leaf and the endocellular fibres are effects of one and the same cause, but hitherto this has not been demonstrated experimentally.

The practical measures suggested by the facts which have been ascertained by the writer's researches concern principally the necessity of establishing experimental nurseries with a view to finding the means of protecting the mother plants from the injurious effects of the coastal climate.

BACTERIAL AND FUNGOID DISEASES

FUNGI

68 – On the Weather Conditions that favour the Breaking out of Vine-Mildew.

SÁVOLY, F. Ueber die Lebensansprüche der Peronospora der Rebe an die Witterung. *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten. Zweite Abteilung*, Vol. 35, Nos. 17-19, pp. 466-472. Jena, October 30, 1912.

In 1907 Prof. Gy. v. Istovánffi, Director of the Ampelological Station of Budapest, being engaged in research on the life history of the vine mildew, decided to study more closely the very important influence that the weather has upon this fungus. What was contemplated was not a laboratory experiment, nor the determination of the special conditions of a limited wine-growing district; but an experiment on a grand scale which should afford a sound arithmetical basis to the relation existing between the attacks of mildew and the course of the seasons in the whole of Hungary, taking into consideration the great diversity of conditions prevailing in the various parts of the country.

The vine thrives well, at suitable altitudes, in the whole of the kingdom, the general configuration of which may be likened to that of a huge basin, the bottom of which is formed by the extensive Alföld, a plain situated at from 80 to 100 metres (270 to 330 feet) above sea level, and the sides by the chain of the Carpathians with the gentle slopes of its foot hills. Whilst the isohyetose lines, both the yearly ones and those covering longer periods, are situated concentrically round the Alföld, which is the relatively driest part, the isotherms run almost parallel to the parallels of latitude.

A future publication will contain all the details of the experiment, of the methods employed and of the results obtained; this paper is only a preliminary communication.

Beginning with the year 1907, all the data given by the agricultural press of the country during the preceding ten years on the relation between the outbreaks of mildew and the weather were collected and examined. The result was a confirmation of the well known fact that the disease prevails and is especially severe in wet years. Another observation of greater importance than the above general result was the recognition of the individual behaviour of some regions, distinguished by special meteorological conditions, towards mildew.

As meteorological data, those supplied by the Government stations were utilised; the data on the mildew invasions were collected with the assistance of thousands of farmers living in all parts of Hungary, who were requested to forward to the Royal Ampelological Station suspected or diseased parts of vines on the very first suspicion or appearance of mildew. The material thus collected was examined at the Station. Stress was laid upon collecting data referring to the first outbreaks of the disease, inasmuch as only these have any value in establishing a connection between mildew and the course of the weather. In order to make sure of the exactness of the data collected, the administrative district was considered as the unit of area in respect to the outbreak of the disease, and it was held to be infected from the date on which the first notice of the disease was sent in. The confirmation of the intelligence was given by the subsequent notices which followed each other, from the same district. On the other hand, the probability that one information really gives notice of the first appearance of the disease diminishes as summer wears on; and the notices act as a check upon each other when in successive years those from neighbouring districts come in in the same order. In such cases the belief is justified that certain external conditions exist which favour the appearance of mildew earlier in some localities than in others.

In order to diminish the probability of error, the dates of the first appearance of mildew were grouped in periods of unequal length, each of them comprising a greater number of days as the season wore on, and thus offered an increasing probability of likelihood. The first period is of 2 days, the second of 3, the third of 10, the fourth and the fifth of 15 each, the sixth and the seventh of 31; the total period extending from the middle of May to the end of August. Further, all the data were considered only when grouped together in averages. For these detailed investigations the material collected during 1910 and 1911 was used. Two thousand cases of mildew were recognised in the material sent to the Ampelological Station; of these, two hundred in each of the two years indicated the outbreak of the disease in a given district. The dates of the first appearance of mildew were grouped in periods of time gradually more distant from each other and plotted out on a map, surrounding each group with a line. The curves thus obtained are called by the author the "isophanes" of mildew.

The graphical representation of the dates on which mildew appeared show that the same dates or those near to each other are connected in a series without interval. This proves undoubtedly that the contemporary outbreak of mildew is caused by contemporary weather conditions favourable to infection, and it is easy to recognise in the sinuosities of the isophanes the lines which mark the quantities of rainfall in each rainy period.

This forms a first basis for the valuation of the biological value of climatic conditions in regard to mildew.

The isohyetes of the greater quantities of rainfall in April and at the beginning of May nearly coincide with the lines of the first isophanes. In the same manner as the isohyetes of given periods of rain represent diminishing quantities, the isophanes represent successive and increasing periods of time. Consequently the quantity of rainfall influences the time of the outbreak of mildew, or in other words, the spread and probably the intensity of the disease are determined by the gradient of the rainfall. Inverting the postulate, it may be said that from the gradient of the rainfall in a district the first appearance and the trend of the further course of the parasite may be deduced.

It has been further observed that the later isophanes enclose the earlier ones: it may therefore be affirmed that, within the limits of Hungary, the fungus does not make its appearance here and there at hazard, but that it follows an uninterrupted course which seems to depend upon certain determined circumstances.

As is proved by the isophanes, the spread of the disease depends to such an extent upon climatic conditions and the physiographical character of the soil, that one might almost deny the efficiency of the means of control if it were not for the fact that it is just the incomplete or delayed application that explains how the disease can continue its course, though with diminished intensity.

As is to be expected, the condition and configuration of the land exert a great influence on the isophanes: Extensive wooded regions, or mountains on which the vine does not grow, hinder the spread of the disease, while river valleys, low-lying lands liable to floods, or those subject to mists, favour it.

As regards the meteorological factors, the temperature and the quantity and frequency of rain were recorded in every locality and for each period after the 1st of April, that is during the time in which the outbreak of mildew is possible.

Since equal intervals of time, though they lend themselves to meteorological observations, have (as the writer demonstrated by experiment) no value in connection with the life-history of mildew, because they almost always comprise days in which the weather is of the most varied and even opposite character, the writer limited himself to the factor rain, and divided the time into periods of rainy days and of dry days. He determined the average number of rainy days, the frequency of the rain, the temperature of every single locality in which mildew appeared, for all the periods both of rainy and of fine days from the 1st of April up to the date of the outbreak of the disease.

With the single averages for each isophane he calculated separately the average for that isophane during the dry periods and the rainy ones, and then for the whole period from the 1st of April up to the date of the appearance of mildew on that isophane.

By multiplying this number by the number of days that elapsed between the first of April and the date of the real outbreak of mildew, a coefficient is obtained in which each factor is represented.

This coefficient is called by the writer a *bios*. Though it may not have an absolute value, its practical utility cannot but be recognized. In 1911 mildew appeared on the 15th of May. Calculating the values of the bios for every isophane, the following results were obtained:

isophane	I	II	III	IV	V	VI	VII
bios . .	631	625	522	427	405	400	256

There is thus an uninterrupted diminution in the number of the bios the further one goes from the first isophane, in which mildew broke out on the 15th of May. Admitting that the course of the weather is enough to cause the outbreak of mildew in the belt of the first isophane, when the value of the bios was 631, it may be asked at what date will the climatic conditions in the meantime prevailing in the belts of the other isophanes cause the outbreak of mildew in them? With the help of the above bios a simple arithmetical calculation shows that in respect to the first isophane mildew will appear in the

II	III	IV	V	VI	VII	isophane in days.
45	54	66	70	91	111	
(48)	(51)	(62)	(77)	(92)	(123)	

The numbers in brackets are those of the days that really passed before mildew broke out.

The same concordance between calculation and practical observation was recorded in the year 1910 and in the first half of 1912; during this latter period, in almost all the localities infested by mildew the value of the bios ranges from 600 to 650; and already in the month of May it was possible to foresee the course that the disease really took and the extent to which it spread.

Without the intention of generalizing his results, the writer concludes by expressing the wish that similar researches should be undertaken in other countries also.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

69 - **Fungi injurious to Rice in the Philippines.** — See above, No. 27.

70 - Treatment for *Bremia Lactucae, Peronospora effusa* and *Heterosporium variabile* on Vegetables (1).

SCHNEIDER, NUMA. Traitement du Meunier des Laitues et Romaines et du Mildiou des Epinards. — *Revue Horticole*, Year 84, No. 21, pp. 493-494. Paris, Nov. 1, 1912.

Lettuces and cos lettuces raised under glass after October for forcing purposes are often attacked by *Bremia Lactucae* (or *Peronospora gangliiformis*). The writer has, during some years, found that a good method of controlling this disease is to cover old forcing beds, previously broken up and levelled, with an inch or more of pulverised white wood charcoal, or twig charcoal, sowing the seeds not too deeply and covering them also with a thin layer of powdered twig charcoal. The hot-beds on to which the plants were pricked out, were also covered with a layer of powdered charcoal, which was pressed down firmly so as to keep the leaves of the plants quite away from the soil. The treatment was completed by a sulphur application on a fine day at the end of November, or in December. The same treatment can be applied to cauliflowers, raised under glass at the same season.

Dusting with sulphur has been found an efficacious remedy in the case of *Peronospora effusa* and *Heterosporium variabile*, parasites of spinach; as the first application had been removed by the rain, the process was repeated a second time, using a special bellows, and in such a manner as to reach the lower surface of the leaves.

At the time of gathering, only a very small amount of sulphur adhered to the spinach leaves, and this disappeared after they were well washed.

The necessary quantity of sulphur for the treatment is very small.

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(1) See also No. 418, *B.* Feb. 1912. (*Ed.*).

71 – Infection Experiments with *Thielavia basicola* on Ginseng.

ROSENBAUM, J.: in *Phytopathology*, Vol. II, No. 5, pp. 191-196 + plates XVIII and XIX. Ithaca, October 1912.

One of the most common and serious diseases affecting ginseng has been attributed to *Thielavia basicola* Zopf. While several workers in different parts of the United States have observed the fungus associated with the disease, no definite inoculation experiments on this host have ever been reported.

The fungus is very widely distributed and has been associated with a wide range of hosts belonging to 11 entirely different families. It has been reported from Germany, Russia, Belgium, England, Italy and Korea. In the United States it has been reported from several States. In the case of ginseng, the fungus is able to attack plants of all ages, being most severe on seedlings, where it is known by the growers as "fiber rot" or "end rot." It not only attacks the roots of seedlings and older plants, but has been found causing cankers an inch or more in length on the stems. Most commonly these occur at the point where the stem emerges from the ground. These cankers at first cause a discoloration, followed by a drying and splitting of the stem in a longitudinal direction, allowing it to break over. The disease has been observed to attack the ginseng plant in soils of widely different physical characters; in many cases it seems to be just as severe on new land as on soil which has previously grown several crops.

The writer reports inoculation experiments (inoculations of seedlings; inoculation of ginseng in the soil; inoculations on stems) of *Thielavia basicola* obtained from three different hosts, namely cotton, tobacco and ginseng. The conclusions arrived at from the results are the following:

1. From comparison of cultures from different hosts on various media, from infection experiments and from measurements of spores and mycelium, it appears that the forms of *Thielavia basicola* Zopf found on the three different hosts, cotton, tobacco and ginseng, are identical.

2. While infection without previous injury to the ginseng or tobacco is always obtained in the case of young plants, this is apparently not the case where older plants are used.

3. The fungus is able to attack the aerial as well as the underground parts of the plant; at least this proved to be the case with ginseng.

72 – Apple Leaf Spot.

BROOKS, CHARLES and DE MERITT, MARGARET: in *Phytopathology*, Vol. II, No. 5, pp. 181-190 + 1 plate. Ithaca, New York, October 1912.

The paper under review is a report upon the cause and nature of apple leaf spot and includes data and discussion in regard to inoculation experiments with various fungi, studies on different forms of *Sphaeropsis malorum*, and experimental work on time of infection, influence of cultivation and methods of control.

Spray injury, intense sunlight following showers, frost, and a number of different fungi, including *Coniothyrium pirina* (Sacc.) Sheldon (formerly known as *Phyllosticta pirina*), *Phyllosticta limitata* Pk. and *Sphaeropsis malorum* Pk., have been credited with causing the disease. Inoculation experiments were made by I. M. Lewis in 1908-1909 with spores from pure cultures of *Sphaeropsis malorum*, *Coniothyrium pirina*, *Coryneum foliicolum*, *Alternaria* sp. and *Fusarium* sp., which had been isolated from the affected areas, but only negative results were obtained.

The writers have made a study of *Sphaeropsis malorum* from different sources and have isolated three strains or types that are particularly distinct. The first has broadly conical unilocular pycnidia and produces oblong spores measuring 12 × 26 to 38 μ; the second strain produces egg-shaped spores measuring 14 × 23 μ; the third is characterised by a distinctly multilocular pycnidium; all three forms are ostiolate. The first strain is the most common on cankered limbs, but pycnidia of the second form were found several times in such positions.

The cultures obtained from leaf spots always produced pycnidia of the first form.

Only the first form of pycnidium wes found on the fruits of apples and quinces in the field. All three forms were obtained in cultures made from spots on apples, but the first was much more common than either of the others.

From the inoculation experiments made with the three strains on the foliage and fruit, the writers conclude that: 1. The leaf spot of apples as it occurs in New Hampshire orchards may be produced by *Sphaeropsis malorum* Pk. and is probably largely due to that fungus. 2. Of the several strains of *S. malorum* which may be obtained, the large-spored form is largely responsible for the production of leaf spot. 3. Infection may occur from the time the leaves unfold till the last of August. 4. Cultivation, spraying and the removal of cankers are important in the control of the disease.

Either Bordeaux mixture or lime-sulphur is an efficient remedy for the disease; but as under New Hampshire conditions Bordeaux often injures the leaves of Baldwin and other varieties, lime-sulphur seems to be more satisfactory.

73 - A new *Gnomonia* on Hickory Leaves.

WOLF, FREDERICK A.: in *Annales Mycologici*, Vol. X, No. 5, pp. 488-491 + pl. XVI. Berlin, October 1912.

Upon the leaves of the shag bark hickory (*Carya ovata* (Mill) K. Kock) in the vicinity of Auburn, Alabama, one finds in late summer and autumn an imperfect fungus, *Gloesporium Caryae* Ell. & Dearn. This fungus causes the formation of large diseased areas, 1-2 cm. in diameter, reddish-brown in colour, without a well-defined margin. In case the affected areas become confluent they exceed this measurement in extent and are irregular in outline. Minute brown pustules, the acervuli of the fungus, are present in abundance upon the lower surface of the diseased areas.

Affected leaves were collected by the writer during the autumn and put away to winter out of doors. By May 4th mature perithecia had been formed in the areas occupied the preceding autumn by the *Gloeosporium* stage. Further examination showed that this perithecial stage agreed morphologically with that of the genus *Gnomonia*. This fungus had been cultured from both the conidial and the ascosporic stages. In order to add further proof to the identity of the two forms inoculation experiments were attempted. Inoculation upon hickory leaves with pure cultures of ascosporic material (*Gnomonia* stage) resulted in infection and the subsequent development of the conidial stage (*Gloeosporium*). These conidia, when used in turn for inoculation, resulted in the production of acervuli and conidia. Inoculation in the field with pure cultures of both the ascosporic and conidial stages, made by laying small pieces of the infected material upon the under surface of leaves, produced infection.

The new name, *Gnomonia Caryae* (1), is proposed for this perfect stage. Complete descriptions of both stages of the species and detailed illustrations are given.

74 - **Withering of the Plane Tree due to *Gloeosporium nervisequum*.**

VOGLINO, P. Il seccume del platano. — *L'Italia Agricola*, Year XLIX, No. 21, pp. 508-509. + 1 coloured plate. Piacenza, Nov. 15, 1912.

For some years past, the plane trees of the avenues of Turin and the neighbourhood have been subject to withering due to the attacks of *Gloeosporium nervisequum*. Hitherto, the fungus has only appeared on the leaves, which it caused to wither along the course of the primary and secondary nerves, the petiole also being affected. The infected leaves fell prematurely at the beginning of spring and the growth of the plant was completely interrupted, but only for a short time, however, for fresh leaves arose from new buds, and a change in the conditions in their environment having taken place they were immune from the attacks of the parasite. In 1912, however, the disease appeared in a more serious form, which had already been observed in other parts of Italy in 1905 and in France during the last few years.

The fungus, instead of attacking the nerves and petiole only, extended its ravages to the nodes from which the leaves arise, and where the axillary buds are formed; it spread along the bark above and below the node, penetrating into the woody tissues, where it produced many black protuberances, which contained the reproductive bodies of the parasite. The axillary buds died, the foliage in some cases was completely destroyed, while the nutrition and further growth of the tree were much impeded.

If the disease made its appearance in this aggravated form for several years in succession, the trees would suffer severely.

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(1) Prof. Geo. F. Atkinson, Cornell University, Ithaca, N. Y., is of the opinion that *Gloesporium Caryae* Ell. & Dearn is identical with *Discosia rugulosa* B. & C. (*The Author*).

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

75 - The Chief Russian Species of Dodder.

LARIONOW, D. Die Hauptarten der Russischen Seide und ihre Massregeln. — *Annalen der Samenprüfungsanstalten am kaiserlichen botanischen Garten zu St. Petersburg*, Vol. I, Part 4, p. 27. St. Petersburg, 1912.

This communication givs a description of the biological characters of *Cuscuta*. The writer considers *Cuscuta* to be an annual plant and attributes its passing the winter to the germination of its seeds in autumn producing winter forms. *Cuscuta obtusiflora*, H. B. K. var. *breviflora* Engelm. occurs in the Government of Astrakan on red pepper, onions and even on potatoes; this species is one of the rarest and occurs sporadically.

C. Epithymum Murr. is met with on *Papilionaceae, Labiatae, Daphne* and *Crupina vulgaris* and is of very wide-spread occurrence. A classical district in which this species is abundant is the neighbourhood of Balaclava (Crimea).

C. racemosa Mart. has begun to spread in the Governments of Ekaterinoslav and Chernigov. *C. planiflora* Ten. is abundant in the Crimea, Caucasus and Central Asia; the lucerne of Turkestan is much attacked by it. *C. europaea* L., which is common everywhere, injures hops, tobacco, hemp, poplars, alders, stinging nettles and *Lycium barbarum* L.

C. Epilinum Weihe is found on flax in the Baltic Provinces and the Governments of Jaroslav and Kursk, on *Camelina sativa* in the Government of Kiev, on *Lolium* and *Spergula;* it occurs sometimes, but not often, in clover seed.

C. cupuliformis Kroeker is found on garden trees and on lupins. This species, especially in the south, is very wide-spread. *C. monogyna* Vahl. is also parasitic in the south on *Lycium barbarum, Prunus Amygdalus, Salix, Artemisia* and *Helianthus.*

The writer draws attention to the fact that it is necessary to take energetic measures for the control of dodders when the gardens are weeded in the spring. The fields should be ploughed over before sowing with buckwheat and millet, and burning should also be resorted to if necessary.

It is very necessary that seed control stations be established and that sacks be sealed. The writer advises inspection on the frontiers for the purpose of preventing the introduction of dodder-infected clover seed to Russia. The sacks which have been sealed at foreign seed control stations, need not be subjected to inspection.

76 - Bersim Dodder (*Cuscuta aegyptiaca* n. sp.).

TRABUT, L. La Cuscute du Trèfle d'Alexandrie, *Cuscuta aegyptiaca* sp. n. - *Bulletin de la Société botanique de France*, Vol. LIX (Series 4, Vol. XII), 1912, 6, Séances de Juin 1912, pp. 489-491, plate XII. Paris, Nov. 13, 1912.

In 1912, as a result of the importation of bersim (*Trifolium alexandrinum*) seed direct from Egypt, a dodder appeared in Algeria, which is very common in the Egyptian crops and is called by the natives " hamoûl ".

Bersim dodder spreads very rapidly and grows at a remarkable rate. Unless energetically suppressed, this parasite hinders seed production, for it is especially the last spring shoots, which flower and bear the seeds, that this dodder attacks. The pest seems to follow bersim wherever it is cultivated. The species of *Cuscuta* in question was observed for the first time by Lippi, who named it *Cuscuta aegyptiaca*. Later, Fresenius called it *C. arabica* and described a specimen from Sinai ; this name was used subsequently by other writers.

The study of a large number of specimens decided the writer to separate bersim dodder from *C. arabica* Fres. It appeared to him, that the name *C. aegyptiaca* used by Lippi should be resumed to distinguish this dodder; though probably derived from *C. arabica*, it has already acquired red sufficiently distinctive characters to prevent its being confused, even with this very near ally. It is under the name of *C. aegyptiaca* n. sp. that M. Trabut gives a systematic description of the plant studied.

77 - On the Properties of Germination of the Seeds of Different Weeds.

GÜMBEL, HERMANN. Untersuchungen über die Keimungsverhältnisse verschiedener Unkräuter. — *Landwirtschaftliche Jahrbücher*, Vol. XLIII, Part 2, pp. 215-331. Berlin, 1912.

The writer has made a series of experiments with regard to the germination properties of various weed seeds : charlock, wild radish, false oat, cornflower, etc.

One result, among others, of these experiments was that the seeds of charlock should be numbered amongst those that germinate best under the influence of light. Comparative experiments made in light and in darkness showed the great importance of the condition of the seeds (age, stage of maturity, etc.) as regards the germination process and the secondary part played by temperature and its variations.

Exposure to strong sunlight may be highly injurious to germination. Desiccation of the seeds, which should be carried at least to the degree of air-dryness, as a rule augments the germination percentage. But at great depths in the soil even a whole period of drought has no influence on germination. Cold had an unfavourable effect on the seeds left on the surface of the soil in the open in winter: false oat, charlock, radish and cornflower. In the case of false oat, injury occurred even when the seeds were covered with soil. The depth at which the seeds germinate, and their development, depend much on the nature of the soil.

Seeds of charlock may be of different colours, but black is their normal one, brown denoting abnormal maturation and arrested development.

Under favourable conditions, charlock seeds develop beneath as much as 2.8 inches of soil. The optimum germination depth is, however 1.2 in. The writer considers that amongst the common graminivorous birds those of largest size may be considered important allies of the farmer in the control of weeds.

In preparing the food for domestic animals it is advisable to boil or chop up finely all fodder containing weeds, but even without this precaution, the danger of the fields being infected by means of the live stock is less than it is supposed to be.

78 - Tor-Grass or False Brome and its Eradication from Down Pastures.

HUTCHINSON, HENRY P. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 8, pp. 648-657 + fig. London, Nov. 1912.

Large areas of Down pasture land have little grazing value owing to the presence of the weeds *Brachypodium pinnatum* L. or False Brome, and *B. sylvaticum* or Slender False Brome; the former is the species chiefly met with in pastures. Whilst they have a low value as forage they spread rapidly; being perennial and tufted in habit of growth they soon choke out the finer grasses and clovers. The plant is able to withstand excessive dryness owing to its extensive root system. It is spread from place to place by means of its seed which ripens in late summer and is carried by the wind. At the time of ripening sheep will eat the flower heads; in some districts advantage is taken of this fact to check the spread of the plant. Various measures have been tried with the object of eradicating the weed, but nothing entirely satisfactory has been accomplished. It is a regular practice in some parts to burn the grass annually, which renders the fresh growth more tender and more palatable to stock than the older shoots, and if the operation be carried out sufficiently early in the season, flowering is prevented, and further spread of the plant checked.

At the farm of the South Eastern Agricultural College at Wye, the writer tried several methods of control.

Quicklime. — In November some tufts of tor were covered with about 2 inches of quicklime. In the spring the young shoots failed to grow, but later in the summer growth proceeded as vigorously as before.

Better results were obtained from the following treatments:

1. *Application of Salt.* — In May, three small plots of tor, each about 2 perches in extent, were treated with brine of different strengths. These salted plots were much relished by the sheep and cattle and the grass was eaten down close, but after the salt had been washed away by the rains, grazing almost ceased on these plots and the tufts developed again, but no flowering occurred.

2. *Digging.* — In the spring of 1909, 3 perches of tor-grass were cleared by digging. The turf was thrown aside — the soil by this means being removed to a depth of 3 or 4 inches and the subsoil exposed. The latter was forked over, brought to a fine tilth and sown down with a suitable mixture. The seeds germinated satisfactorily, but the plants were weak and the sward ultimately formed was thin. This is what might have been

expected, since the readily available plant food was removed with the turf, and the soil as a rule is thin on the hill sides. It is unnecessary to dig deeper than 3 inches in order to eradicate the weed.

3. *Digging and Burning.* — In March 1910, 6 perches of tor-grass were cleared by digging. The turf was allowed to dry, then barrowed into heaps, and burnt slowly, the heaps being completely burnt out after nine to twelve days. The fine ashes and burnt earth were spread over the cleared plots, which were then ready for seeding, and no new tor shoots appeared afterwards, as the digging had been done carefully and no small pieces of stem had been left in the ground. This method though is expensive, about £5 10*s*. per acre.

4. *Application of Gas-lime.* — In March 1910 on about 12 perches of tor the turf was dug out and while still green built into heaps ; gas-lime was mixed with it, being distributed between the layers of turf; the bare ground was also covered with gas-lime. About 1 cwt. of gas-lime per perch; was used in the mixing and ½cwt. spread. The heaps were allowed to remain about three months and in June were thrown back over the cleared areas. The cost of the treatment was the following:

Cost of digging, etc.	4 *d*.	per perch
„ „ gas-lime	1 *d*.	„
„ „ carting, etc.	1 *d*.	„
Total cost of clearing	6 *d*.	„
	= £4	per acre.

It is very probable that less gas-lime than the quantity used would have been efficacious.

5. *Another Application of Gas-lime.* — On another plot of tor-grass about 12 perches in extent, two loads (about 34 cwt.) of gas-lime were broadcasted over the area as evenly as possible. In June, two months after treatment, all the grass appeared to have been killed. The cost was the following:

Cost of gas-lime	2*d*.	per perch
„ „ carting	2*d*.	„
Total cost of clearing	4 *d*.	
= £2 13*s*. 4 *d*. per acre.		

Other experiments were made to ascertain the minimum quantity of gas-lime required and it was found that it must be applied, as fresh as possible, at about 2½ cwt. per perch. Five months, at least, should elapse from the time of application to the time of resowing. The lime can be applied effectively at any time during the year, but autumn and early winter seem to be the most favourable.

Where gas-lime cannot be obtained, the best method of eradication would be to dig the tor-grass out with a suitable spade to a depth of three inches. Where large patches occur on land which is not on too steep a slope, the tor might be ploughed out. The turf would require to be knocked about with harrows until dry. It should then be burnt or left until killed by the weather. Flowering should always be prevented by mowing, grazing with sheep, or burning, and young tufts should be grubbed out and burnt when first seen.

INSECT PESTS.

RALITIES

79 – Aphid Notes from California.

DAVIDSON, W. M. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 404-411. Concord, N. H., October 1912.

The paper under review reports several plant-lice not heretofore found in California, of which three species are new to science. A few sexual forms are also dealt with and illustrated

The species here recorded are the following:

Cerataphis lantaniae Boisd., taken on ferns in greenhouses; *Phyllaphis coweni* Gillette (syn. *Cryptosiphum tahoense* Davidson); *Calaphis betulaecolens* Fitch, whose sexual forms occur in November on cultivated birch; *Calaphis castaneae* Buckton, whose sexual forms occur in early November on chestnut; *Euceraphis betulae* Kalt., whose sexual female is abundant on cultivated birch in November; *Euceraphis flava* sp. nov., not uncommon on the under side of the leaves of *Alnus rhombifolia* Nutt.; *Aphis cardui*, forming colonies on the young growth of several thistles throughout summer; *Aphis atriplicis* L., occurring on the upper side of the leaves of *Chenopodium murale* L., the sexual forms appearing in August; *Aphis salicicola*, abundant on willows throughout the summer, preyed on by the larva of a *Leucopis* (Agromyzidae); *Aphis maidis* Fitch, colonizing corn; *Amphorophora latysiphon* sp. nov., occurring sparingly on the periwinkle (*Vinca major*) and *Convolvolus arvensis*; *Phorodon carduinum* Walker, on the under side of the leaves of artichoke becoming a pest; very susceptible in California to fungus diseases; *Myzus varians* sp. nov., occurring an wild clematis (*Clematis ligusticifolia* Nutt.); *Amphorophora rubi* Kalt., colonizing the terminal shoots of cultivated blackberry and loganberry and occurring also on the wild thimbleberry (*Rubus nutkanus* Moc.); *Macrosiphum chrysanthemi* Oestl., on the young shoots of a composite; *Macrosiphum granarium* Kalt., on various grasses in spring; *Macrosiphum solanifolii* Ashm., on wild lettuce.

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80 – The Vine Moth Caterpillar Parasite (1).

FRENCH, C. in: *The Journal of the Department of Agriculture of Victoria*, Vol. X, Part 9, p. 552 + 1 plate. Melbourne, September 1912.

During the period from January to April, 1912, many shrivelled-up and dark-coloured Vine Moth caterpillars were noticed on vine leaves, in Victoria, Australia. On investigating the matter, the writer noticed that a parasite had been at work and all the live caterpillars had clusters of larvae on their backs.

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(1) The Vine Moth is *Agarista glycine* Lewin. See: FRENCH, *Handbook of the Destructive Insects of Victoria*, Part II, pp. 101-107. Melbourne, 1893. (*Ed.*)

When the eggs of the parasite (a chalcid fly) are first deposited on the caterpillars, they are exceedingly small, but soon develop. The larvae grow fairly rapidly, and spread all over the backs of the caterpillars. The time occupied from the eggs being deposited until the larvae are fully grown, is about a week. About the second day after the larvae are hatched, the caterpillars cease eating, and remain in one place, and at the end of the week they are simply sucked dry by the parasite. When the caterpillars are dried up, the parasites cover them with a silken covering, and form their cocoons, emerging as perfect insects in a couple of weeks' time.

When the perfect Hymenopterous insects were hatched out in the observation box, live caterpillars of the Emperor Gum Moth (*Antherea eucalypti* Scott) and several species of Cutworm Moth larvae (*Mamestra ewingi* and *Agrotis* sp.) were placed in the box, but the parasite did not deposit eggs on them.

These parasites are reported to be doing good work this season in many parts of Victoria, and it is hoped that they will keep the Vine Moth in check.

81 - The Life History and Habits of *Cheyletus seminivorus* Packard.

EWING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 416-420. Concord, N. H., October 1912.

Cheyletus seminivorus Packard was first found in stored cabbage seed; the species, however, is not an enemy to seeds or to stored grains, for it is entirely carnivorous. When this acarid is found among seeds or in stored grain it is here only to prey upon some other species, which is the real pest.

During the winter 1911-1912 the writer came into possession of a sample of milled wheat which was badly infested by Tyroglyphid mites. Associated with these were found at first only a few individuals of *Cheyletus seminivorus* Pack. Some of these were selected to be used in a series of experiences upon the life history and habits of this species, and the results so obtained are here detailed. A few days after, the same sample was examined and it was found that out of 100 Tyroglyphids counted, 96 had been sucked by the *Cheyletus* and were dead, and only 4 were alive and active. Thus in a short period of only a few days this predaceous species had multiplied and destroyed about 95 per cent. of the pernicious Tyroglyphids.

82 - Lime-Sulphur Wash an Inefficient Ovicide for Codling Moth.

SAFRO, V. I. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 385-395. Concord, N. H., October 1912.

Reports have occasionally been published showing a decrease in codling moth infestation following applications of a lime-sulphur wash. Until within the past few years a coating of lime-sulphur upon insect eggs has generally been considered fatal. Only recently have experiments shown a surprising lack of insecticidal power in spraying aphid and red spider eggs with lime-sulphur mixtures.

The paper under review is a report of a preliminary series of experiments conducted during the fall of 1911, in order to obtain data on the possible efficiency of lime-sulphur in killing the eggs of the codling moth. From an infested orchard, more than two hundred apples were collected upon which codling moth eggs had been deposited. These were examined and only the apparently healthy eggs were used in the experiment, which was carried on in a laboratory. At first an attempt was made to spray the apples by means of an atomiser. This method was given up as a failure because the spray collected in drops covering only a small portion of the surface of the apple, in which case the egg was more frequently missed than hit. When the drops of spray were too large they would roll from the apple leaving a practically dry surface. The same would frequently occur on shaking the fruit. This was the first indication of the inefficiency of a lime-sulphur spray for killing codling moth eggs. The failure of a spray to cover the eggs deposited on the fruit is sufficient to exclude it as an ovicide, regardless of its efficiency in the laboratory.

The method finally adopted was to place a drop of the spray material directly upon the eggs. These were divided into four lots : 1) untreated ; 2) treated with a one-to-30 dilution of lime-sulphur testing 30° B (1) ; 3) treated with lime-sulphur one-to-30 with arsenate of lead added at the rate of four pounds to 100 gals. of the diluted spray ; 4) treated with a 5 % solution of calcium polysulphides containing a slight amount of CaS_2O_3. The eggs were treated on the day collected.

The detailed results are tabulated. They may be summarised as follows : 1) 90 of 93 eggs hatched ; 2) 85 of 100 eggs hatched ; 3) 16 of 23 eggs hatched ; 4) 8 of 28 eggs hatched. " With these results, then, it is evident that lime-sulphur, even too strong for use on foliage and fruit, is at best an uncertain ovicide, and its effectiveness is of doubtful value economically. "

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(1) This method of specification of the « strength » of lime-sulphur, so often encountered in the literature, is uncertain, because a specific gravity determination of a lime-sulphur solution is really a reading of two (at least) solutions of unknown densities, present in unknown proportions and of different degrees of chemical activity. These two solutions are the calcium polysulphides ($Ca\ S_4$ and $Ca\ S_5$) and the calcium thiosulphate (CaS_2O_3). The polysuphides are by far the most active chemically and undoubtedly the most important insecticidal ingredient in lime-sulphur.

The nearest approach, at present, to a logical determination of the « strength » of lime-sulphur is a statement of the amounts present of calcium polysulphide and calcium thiosulphate. The writer used a 5 % solutiom of calcium polysulphide as a more certain test in addition to « a one-to-30 dilution of lime-sulphur, testing 30° B. ».

(*The Author*).

83 – **Campaign against *Agrotis ypsilon* in India** (1).

A Communication from the Director of Agriculture, Behar and Orissa, to the International Institute of Agriculture.

In the Entomological Section of the Agricultural College at Sabour the most important work during September and October 1912 was the campaign against *Agrotis ypsilon.* When the land was under water, the traps were set up on high lands near villages, and with the receding of the flood water they have been moved down lower and arranged according to our scheme of work. During the last two months, up to the end of October, 68 000 moths have been captured, which would, in the ordinary course of things, have given rise to 10 millions of caterpillars. Some first attacked areas have been picked off, and the number of caterpillars destroyed is 53 000. Owing to the abnormal weather conditions prevailing in the Province, the crop on the land is not as satisfactory as it should be. The campaign work is getting on satisfactorily. The effect of the work will be evident in another month's time.

The potato-storing demonstrations have been wound up, as the season is over. A report on this work will be published later.

84 – **Insects injurious to Rice in the Philippines.** — See above, No. 27.

INSECTS INJURIOUS TO VARIOUS CROPS

85 – **Moth Borer in Castor Oil.**

The Rhodesia Agricultural Journal, Vol. X, No. 1, pp. 102-104. Salisbury, October, 1912.

Experimental plantings of castor oil in the Transvaal and Rhodesia have shown that the insect factor is one of the more serious handicaps to success. This view has been amply supported by the results of a small planting made in the spring of 1909 at the Experimental Station, Salisbury. By the 1911-1912 season practically every plant of the original planting was infested by ***Duomites capensis.*** It should be noted, that plants which had grown from dropped seeds germinating in the spring of 1910 had not yet been attacked.

Several species of insects have been observed to damage the castor oil in Rhodesia, but by far the most harmful is the Moth Borer (***Duomites capensis***), which bores the stems and branches. The eggs are laid in masses on the stem of the plants near the ground level and are yellowish in colour, smooth-surfaced and shiny. The method by which the young larvae obtain entrance to the stem has not been observed, but it is possible that they make their first few meals inside the leaf buds and penetrate thence into the stems. The exit holes of the moths are nearly always on the lower part of the stem or branches and the first damage is usually on the lower part of the stem.

The full-grown larva measures rather over 2 ½ inches in length; it is thick and fleshy with prominent segments. The period of the larval stage has not been accurately determined, but in this family (*Zeuzeridae*) this period is sometimes prolonged over more than a year. This species does not produce only one well-defined brood in the year, as half-grown larvae and full-fed larvae and pupae have been found in the same plant at the same time, and some adult moths have bred out in May and August, while the moths in the Transvaal have been recorded by Thomsen to have emerged in September and October.

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(1) See No. 1586, *B.* Nov. 1912. (*Ed.*).

The female pupa is nearly 1 3/4 inches in length and is a little larger than that of the male, which sometimes measures as little as 1 1/4 inches. The female moth is considerably larger than the male and is provided with a prominent ovipositor with which to insert its eggs into crevices in the plant. The attacks of these insects are frequently followed by those of " white ants ", which complete the work of destruction very thoroughly. Borers are amongst the most difficult of insects to attack, and several methods are suggested for their destruction; probably the measures which are used in England against the " Goat Moth " would be effective — a thick paste made of clay, lime and soft soap is smeared over the stems and branches to prevent egg deposition.

To destroy the borer in the stems, a small piece of cyanide is inserted into the hole and the latter is stopped with clay. A few cubic centimetres of carbon disulphide injected into the burrow and the hole plugged is a method also likely to be very effective.

When the borers are killed by one or other method, the holes should finally be stopped up with grafting-wax, or some other substance, to prevent the ingress of other insect-enemies and injurious fungi.

86 - *Leucoptera coffeella*, an Insect Parasitic on the Coffee Plant at Sao Paulo Brazil.

THERING, RODOLPHO (von). Nossos cafezaes ameaçados de una praga que ja' arruinou os fazendeiros do Rio. — *Chacaras e Quintaes*, Vol. VI, No. 4, pp. 1-7. S. Paulo, Brazil, Oct. 15, 1912.

The coffee plant in Brazil is, at present, one of the least subject to pests; nevertheless, it did not enjoy this total immunity in the past.

Thus from 1880 to 1890 *Heterodera radicicola* infested the roots of the coffee plant in the State of Rio Janeiro to such an extent, that the crop in some cases was reduced by 95 per cent. The nematode afterwards disappeared suddenly. About the same time, there appeared in this State the " bicho do café " (the insect which the present article mentions as occurring in the State of Saõ Paulo); its ravages were estimated by Delacroix as affecting 35 per cent. of the crop, and by Van Delden Laerne as destroying the whole crop in some plantations. This dangerous parasite is a microlepidopter belonging to the family of the *Tineidae*, subfamily *Lyonetianae*.

It was observed for the first time in the Antilles by Perrotet and determined in 1848 by Guérin-Minerville, who named it *Elachista coffeella*. In 1861, Stainton placed it in the genus *Coniostoma*. Lord Walsingham

(*Proc. Zool. Society*, London, 1897, p. 141) recognized that this genus is identical with *Leucoptera*.

As the latter appellation had the priority, the writer gave the insect the name of *Leucoptera coffeella* Guérin. He mentions among related species, *L. scitella*, which does great injury in Europe to the leaves of apple, pear, etc.

The havoc is wrought by the larvae; these are scarcely visible to the naked eye, and they penetrate through the cuticle of the upper surface into the leaves and devour the parenchyma situated between the two layers of epidermis. The latter in the end separate from the parenchyma, becoming somewhat prominent, and assume a brown or reddish hue, hence the name of "rust" given to the disease in the Antilles and that of "iron spot" (*mancha de hierro*) by which it is known in Venezuela.

A single leaf can support several larvae (as many as 25 have been counted). The larvae remain in the leaf from 7 to 8 days, according to Perrotet (whose observations were made in the Antilles) and from 18 to 20 days, according to Pickmann Mann, who studied the larvae at Vassouras, in the State of Rio Janeiro. The discrepancy in the data is doubtless due to the differences of the localities and the climate.

The larvae escape from the leaf by making on the latter an aperture 1 mm. in size, most often upon the lower surface, where the cocoon is usually attached. The chrysalis period lasts barely 6 days (only one observation has been made on this subject). There are several generations in the year; these are most numerous in mild winters.

Leucoptera coffeella has a wide area of diffusion; in America, it is found in the Antilles, in Venezuela and in Brazil (where it was probably introduced from the Isle of Bourbon towards 1860); it also occurs, amongst other places, in Madagascar, Réunion and Mauritius.

Some observers believe that the insect is indigenous in Abyssinia, where it lives on the wild coffee plant.

It appears that *Coffea arabica* is alone attacked, *C. liberica* being immune. The amount of damage caused by this pest is very variable, being sometimes very slight, when a few leaves are a little injured; at other times much injury is done, and the plant is so much weakened by loss of sap that one-fifth of the flowers fall off.

The present limitation of the injuries is probably attributable to the action of the parasites of *L. coffeella*, viz. *Eulophus cemiostomatis*, *Exothecus letifer*, a species of *Apanteles*, and another, hitherto undetermined, species of *Eulophus*. The writer has succeeded in breeding a hyperparasitic chalcid.

Lamp traps are recommended as a means of control (for the moths are nocturnal); also the collection of all fallen leaves containing larvae, which should be burnt, or at once buried; another measure is the rearing of the natural parasites of the pest. This is effected in small breeding boxes provided with nets with meshes fine enough to prevent the escape of the parasite of the plant, while at the same time permitting the passage of the parasite of the insect. The writer adopted the latter method in the work he is carrying on.

In the appendix, there is a bibliography of 9 works.

87 - **The Occurrence of the Citrus Red Spider (*Tetranychus mytilaspidis* Riley) on Stone and Pomaceous Fruit Trees in Oregon.**

EWING, H. E. in *Journal of Economic Entomology*, Vol. 5, No. 5, pp. 414-415. Concord, N. H., October 1912.

In November 1911, while examining some leaves and twigs of apple trees at Corvallis, Oregon, for the common red spider (*Tetranychus telarius* L.), the writer came across *Tetranychus mytilaspidis* Riley, the well-known red spider of citrus trees in Southern California. Since this observation several records have been made of this species in Oregon.

In the paper under review the writer submits notes on its biology and economy under the influences of its new host plants and new climatic conditions, and presents in tabular form the records of the species made in Oregon,

Here in the autumn eggs are deposited on the twigs. These eggs hatch in the following April and the larvae feed upon the tender leaf shoots. These mites continue to feed and reproduce from the time of hatching until the end of the rainy season, but with very little vitality. It is during July that the adults become very active and the eggs are found scattered about all over the leaves, the species becoming very injurious by sapping the juices from the leaves and causing the latter to become pale or spotted and to curl up around the edges.

As means of control summer sprays and, even better, some dormant spray to kill the eggs are advised.

Lime-sulphur is not a satisfactory winter spray for the eggs of this mite. It will not kill the embryos in the eggs at all, but will, however, kill some, and at times perhaps 60 or 70 per cent, of the larvae after they have emerged.

88 - ***Earias chlorana*, a Parasite of *Salix viminalis* (1).**

FEYTAUD, Y. Les Insectes de l'Osier: *Earias chlorana* Linn. — *Bulletin de la Société d'Etudes et de Vulgarisation de la Zoologie agricole*, Year II, No. 4, pp. 89-97 Bordeaux, 1912.

The osier is one of the most widely cultivated plants of south-west France, especially in the Gironde and Corréze.

Salix viminalis Linn. ("Osier blanc," the basketmakers' osier) is the most common species in the osier beds of this district, and seems to be the most liable to fungus diseases, and to the attacks of parasitic insects. After the month of August, a rust of the genus *Melampsora* attacks nearly all the leaves.

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(1) See No. 876, *B.* May 1912; No. 1702, *B.* Dec. 1912. (*Ed.*).

Amongst the insect enemies of the osier, the goat moth (*Cossus ligniperda* Fabr.) and *Sesia* sp., the Longicornia *Lamia textor* Linn., *Oberea oculata* Linn. and *Aromia moscata* Linn., and especially the beetle *Cryptorrhynchus lapathi*, Linn. make galleries in the underground stems; while the *Chrysomelina*, of which the writer has already made a careful study (*Bulletin de la Société de Zoologie agricole*, Bordeaux, 1908 and 1909), *Earias chlorana* Linn., *Sarrothripa revayana* S. V., and many other species destroy the portions above groud.

The two latter species devour the shoots, which leads to the suppression of the terminal buds, and causes the osiers to ramify and to become valueless to the basket maker.

The last-mentioned species is always much rarer than the first in the osier beds of south-west France. In this district, there are two generations of *Earias chlorana* annually. The first does havoc in May-June, the second in August-September and passes the winter in the chrysalis condition. The moths, which appear in May and in July, lay their eggs on the extremities of the osier shoots, one on each shoot.

The caterpillar makes a cigar-shaped sheath by rolling together the neighbouring leaves of the terminal bud. It leaves untouched its sheltering sheath, and only devours the inner leaves.

The writer counted more than 50 per cent. of infected shoots in some plantations. No remedial treatment can be practised with the view of affecting the ensheathed caterpillar; the best control method is the collection and destruction of the cigar-shaped sheaths. The use of insecticides or insectifuges is less recommended, since the hatching period of the eggs of a single generation may extend over more than a month, which, together with the rapid renewal of the terminal leaves, would render the application of these remedies very difficult.

To obtain any result, the treatment would have to be repeated every week or ten days during the laying season; this was in fact done by the writer, in his series of experiments. He states that he observed a sensible diminution of the damage after three applications of a simple cupric mixture, and more so when he used a cupro-phenic, or cupro-nicotine mixture. Better results were obtained by dipping the extremities of the shoots into the compound than by spraying them.

These treatments can only be carried out in the spring, as the osier beds become too thick in August-September.

Cupric mixture sprayings are very efficacious, not only in the case of *Earias*, but also in that of *Chrysomelina*, and rusts. It is possible after having once cleared an osier bed of *Earias* by the repeated removal of the sheathed larvae, to guard against reinfection by the setting of lamps or baited traps.

A bibliography of 11 publications is appended.

INJURIOUS VERTEBRATES.

INJURIOUS VERTEBRATES

89 - Crows and Rooks in Agriculture.

JABLONOWSKY, J (Director of the Budapest Entomological Station) A Varjak a Mezögazdas ágban. — *Kisirletügyi Közleményck*, Vol. XV, No. 3, pp. 466-508. Budapest, July-Sept. 1912.

This is a detailed study of the ,part played by crows and rooks in agriculture, according to publications printed in Hungary and elsewhere. The question is one of importance to practical agriculture everywhere where there are large numbers of rooks, and is one which affects the agriculturist, ornithologist and agricultural entomologist. Species of *Corvus*, especially the rook (*Corvus frugilegus* L.), have partisans who regard them as actual allies of agriculture, but their detractors aver that they are injurions. The writer belongs to neither side.

In an earlier publication (*Kisérletügyi Közlemenyck.*, Vol. IV, No 2, 1910) and elsewhere, he discussed the data obtained out of Hungary. The present work is a critical study of data collected in Hungary itself, and shows that the supposed utility of the rook was based on false biological views and one-sided statistics. The writer states that the examination of the stomachs of rooks and of other insectivorous birds (killed by thousands) do not furnish the expected proof of their utility, but show, on the contrary, that they have destroyed inoffensive birds. Taking these observations as a basis, M. Jablonowsky concludes that *C. frugilegus* L. should not be regarded as a wholly useful bird. In places where it builds its nests in large numbers, it is capable of causing considerable damage, which justifies its destruction. In comparison with the harm it does, its utility is very slight. Where it is only a bird of passage, this bird is for the most part inoffensive.

90 - Birds and Rats injurious to Rice in the Philippines. — See above, No. 27.

91 - The Cat Problem in Australia.

LE SOUEF, A. S. in *The Agricultural Gazette of New South Wales*, Vol. XXIII, Part 10, pp. 895-896. Sydney, Oct. 1912.

The domestic cat of Australia has become wild and must be included in the list of the destructive animals of that country.

The cats which have become wild, are in some cases animals which have been turned out into the bush by their owners, others have run away, or have been liberated by stock owners as a supposed enemy of the rabbit.

They have now become established throughout the land and are living on the wild game. They devour small animals, lizards, opossums, and even lambs, as well as rabbits. In the Macquarie Islands they were very numerous and destructive to the sea-birds, which supply the sealers with eggs. It was therefore necessary to introduce dogs for the suppression of the cats. When the latter were killed off, the dogs then attacked the seals, and therefore had, in their turn, to be destroyed. Where the wild cat has established itself, the ground game and small marsupials have greatly diminished, and it seems that in the future the partial extermination of certain species can be counted upon, while its influence on the rabbit question remains yet to be seen.

Wild cats have practically no enemies in Australia. They seem to be reverting to a specialized type, that of a blotched tabby; in parts of Queensland, they are more or less striped and have a heavy ruff round the neck. In Lord Howe Island, they are very dark, mottled grey, much larger than the average house cat, specimens up to 20 lbs. in weight having been recorded.

Alfredo Ruggeri, *gerente responsabile.*

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of December 1912 and January 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Present Condition of Citrus Growing in Spain

by

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According to the latest official figures, which are fairly accurate, there are in Spain 117 459 acres under oranges and 6363 acres under lemons. Other citrus fruits are not grown to any extent, and probably 2500 acres would cover the area under limes and citrons; further, these are hardly ever grown alone, but are planted in small numbers among oranges and lemons.

The production of fruit in 1910 was 782 200 English tons of oranges and 623 250 tons of lemons.

THE CHIEF ORANGE-GROWING REGIONS OF SPAIN.

The principal orange-producing centres in Spain are the renowned adjoining provinces of Valencia and Castellón, the province of Murcia and the province of Seville: these represent three distinct regions.

In the *first* region sweet oranges, particularly Valentian, Imperial, and Tangerines, are almost exclusively grown: these are in demand on the English market and for consumption in Madrid. There are many other varieties, in particular blood oranges, which are much in demand for Germany owing to their good keeping qualities.

Orange growing has long been carried on in this region along the coast and in the lower valleys of the rivers, where frosts are quite exceptional. It has now extended up the lower slopes and first plateaus of the neighbouring mountains, but the crop is here not quite certain. The soil in the orange groves on the low ground is clayey in Castellón and lighter in Valencia, but always deep; out of the valleys the cultivable soil is poor and can only support oranges when carefully improved. This region also includes the groves in the provinces of Tarragona and Alicante, which adjoin it on the north and south respectively. Most of the oranges exported and consumed in the centre and north of Spain are grown in this region. Of the 120 000 acres in Spain, nearly 100 000 belong here, and of these some 850 000 are in the two provinces of Valencia and Castellón. The chief centres of production are Alcira and Carcagente in the wide valley of the Jucar, and Burriana and Villareal in the Mijares valley. The sub-region of the Balearic islands may be put with this region, but its production is declining and of little importance.

The density and even distribution of the population and the careful work of the men who attend to the trees and gather the crop are factors no less favourable than the climate to the good results of orange-growing.

The principal orange-groves in the *province of Murcia* are about Murcia itself and in the lower valleys of the Segura and the Vinalopó. The meteorological conditions are much the same as in the first region. The soils of the Murcia and Segura valleys are mostly more siliceous, and are very well suited for lemons, largely grown in this region, and limes. These two crops, which cover nearly as large an area as the various varieties of oranges, give sweet and exquisite fruit, which does not keep very well.

The distance from the ports has been the chief reason why these crops have not developed as well as in the Valencia region.

The eastern provinces of Andalusia may be included in this second region, with which indeed they are already connected geographically. Almeria and Malaga each grow some 1750 or 2000 acres and Granada about half this area. The valley of the Almanzora and the maritime and central parts of Granada and Malaga are the only areas in which this cultivation leaves the coast and extends to the sheltered slopes of the sierra of the Alpujarra. The soils are formed of transported material and are very fertile owing to the weathering and transportation of the parent Silurian slates.

The commonest varieties are the Chinese orange, the Malta blood-orange, the Grano de oro and Tangerines; the fruit is sweet and of good quality. Bitter oranges are also grown in Malaga and limes in Granada and Almeria.

A good number of cases of oranges are exported to England from this region. The home market takes the lemons and limes at good prices.

Near the limits of this zone, especially in Granada, orange growing is somewhat neglected, so that the trees often suffer from gummosis. As the dead trees are not replaced, the yield is diminishing; it was, however, never more than sufficient for local needs.

The *third* comparatively important region is that of *Western Andalusia*, whose centre is the province of Seville with over 3500 acres of groves. Here the climate is less favourable, owing to the cold winters which are general. The chief districts are Seville, Mairena, Carmona and Dos Hermanas. By the valley of the Guadalquivir this important region communicates with the sub-region of Cordova, where it reaches its northern limit on the sheltered slopes of the cordillera of the Morena.

With this region are also connected the groves in the provinces of Cadiz and Huelva, all on deep and fertile alluvium. The development attained by oranges in this region is generally greater than in Valencia. Bitter oranges do best, as their flowers can stand cold ; on and near the coast limes do pretty well, and those from Conil are celebrated. Many other varieties, both red and yellow fleshed, grow in the gardens and groves beside the ones mentioned.

The cultivation is lucrative here, for the production is somewhat above the consumption and leaves room for export. The oranges picked in autumn are sent away, while those that hang all through the winter and get more or less damaged by frost are sold locally at prices up to 10s. per cwt. ($2.20 per 100 lbs.).

Lack of care, particularly as to manuring and pruning, has led to the trees becoming infested with all the diseases which have recently appeared.

In some of the remaining provinces, such as Barcelona in the north-east, Badajoz and Cáceres in the south-west and Pontevedra and Corunna in the north-west, oranges are grown on a small scale in sheltered places or close to the sea.

The cultivation of citrus trees is not everywhere equally careful. In this respect the east coast (Valencia) region may be taken as a model. The working of the ground is generally satisfactory, except that trenching is not usually carried out before starting a grove : this is due to lack of an economical implement for the purpose.

Manuring is copious, but the formulæ used are not always sound. Irrigation leaves nothing to be desired, as in this region it has long been practised.

In this region the picking begins in early November for Imperia's and Tangerines. Some fruits are picked first rather green to relieve the tree and encourage the ripening of the rest ; a second picking is carried out in January and February, and the late fruits are picked dead ripe up to April. In the province of Valencia there is also a small second crop towards the end of summer — the result of a late and more or less irregular second flowering.

In the Andalusian region the cultivation is much less careful : the manure is almost always insufficient, and the neglect of pruning is shown by the tangled crowns of the trees. For this reason the trees have suffered badly from diseases.

The list of pests which infest all our orange-groves with greater or less intensity is large ; the following are the most important : *Chrysomphalus dictyospermi* Mask.(" piojo rojo "), *Mytilaspis citricola* Pack (" serpeta "), *Dactylopius citri* Risso (" cochinilla algodonosa "), and *Aspidiotus hederae* Vallot (" piojo " or " cochinilla blancos ").

The first of these is the most important, owing to its prevalence and the damage it does ; the agricultural associations and Governement inspectors have organized a campaign against this scale : this campaign began to be effective as soon as hydrocyanic acid fumigation was taken up and the worst attacked provinces were provided with the necessary staff and appliances for the work. The Committee of "ingenieros agronomos" to whom the work was entrusted has now 32 tents and an efficient staff of trained men.

ECONOMICS OF ORANGE GROWING.

The figures given above for the area and yield of citrus fruits in Spain, which show what great importance these crops now have for the country, have been reached in a short period, for in 1870 the production was only one-third of what it is at present.

The upward movement, which was due to the demand on the English market and the extraordinary development of sea-transport, kept on increasing in the last decades of last century. In the east coast region, particularly in Valencia and Castellón, the groves increased very rapidly. In Alcira, Játiba, Carcagente, Villareal, Almanzora, Burriana and many other districts they increased four- or five-fold in a few years. Very poor land was brought under cultivation at considerable expense for improvements, including drainage or irrigation. This great extension slowed down considerably towards the close of the century, owing partly to economic conditions becoming less and less favourable to this superabundant production.

The accompanying table gives the figures for exports for the decade 1901-1910.

Year	Quantity exported		Value of exports	
	Oranges	Lemons	Oranges	Lemons
	tons	tons	£*	£*
1901	280 831	3 354	1 698 438	40 571
1902	362 569	3 189	2 197 617	38 571
1903	389 324	3 017	2 354 593	36 458
1904	402 569	4 040	3 353 571	48 863
1905	308 655	2 437	1 866 706	29 474
1906	386 505	2 072	2 337 541	25 058
1907	461 886	2 814	2 793 438	34 040
1908	458 876	4 088	3 172 090	49 449
1909	453 888	3 084	2 147 673	37 295
1910	489 354	3 188	2 367 652	38 562

* Calculated at 25.20 pesetas to £ 1.

There has been an increase all along, except for irregularities due to variation in the crop. So far no serious difficulty in disposing of the produce has been experienced.

The value of the exports seems to have changed very little during the decade. If the customs figures are to be credited, there was no great deviation from the mean price (5*s.* 6*d.* to 6*s.* per cwt., or $1.22 to 1.30 per 100 lbs.) except in the years 1904 and 1908, when it was exceeded, and 1909 and 1910, when the price was as low as 4*s.* 10*d.* per cwt. ($1.05 per 100 lbs.). From the above figures the changes in price are not very clear, but considering that other reliable figures (1) for 1902 fix the price of oranges at 4*s.* 10½*d.*, it may be taken that the change has not been unfavourable to the production, considering that in the last few years the lowering of price has been compensated by the rise in the value of Spanish currency on exchange.

Can these prices be considered paying for the grower?

Sr. Senz Brenon, in his work "Riqueza agricola de la provincia de Valencia," calculates the average yield of an orange grove in full bearing at 176 lbs. per tree and 18 000 lbs. per acre. The annual expenses, including interest on capital and the writing off of the expenses incurred before the trees come into bearing, amount to £15 ($73) per acre. Taking the fruit fallen and consumed at home as one quarter, and reckoning it at 1*s.* 7*d.* per cwt. (35 cents per 100 lbs.), and accepting the figures given by the Commission on inland customs duties, the annual production per acre may be taken as follows:

13 500 lbs. of oranges at 4*s.* 10½*d.* per cwt. ($1.06 per 100 lbs.) .	£29 7*s* 6*d* ($113.10)
4 500 lbs. of oranges at 1*s.* 7*d.* per cwt. (35c. per 100 lbs.) . . .	£ 3 3*s* 8*d* ($ 15.75)
Total . . .	£32 11*s* 2*d* ($158.85)

There is thus a net gain of about £17 10*s.* ($86) per acre, quite a satisfactory result. In the other orange-producing provinces the conditions are generally no less favourable. While there is no other region in which the production is so considerable (the average for the whole of Spain being not above 13 500 lbs. per acre) or so valuable, yet elsewhere the cost of production is generally less owing to the lower value of the land and the cheaper labour, as in the Andulusian provinces.

The condition of citrus growing would be better if both the yield and the means of disposing of it were always in a normal state. But owing to complex circumstances, this desirable situation is frequently not attained. At numerous places in the east coast region, particularly in the province of Castellón, the groves have been established on unsuitable soil, necessitating heavy expense for its improvement. To obtain water, for instance, wells had to be bored through rocky beds. In such cases the costs of forming the grove entail a much heavier charge on the annual expenses, and the yield generally does not equal that of the valley groves.

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(1) See: *Actas y trabajos de la Comision extraparlamentaria de consumos,* "*Estado 45*". *(Author's note).*

In many places, certain factors of more or less constant and general action, such as the steady rise in rents of land and the new diseases, have an unfavourable influence on the economics of production. Again, while so far the disposal of the produce has always been possible, yet it is less easy than formerly, and the characteristic difficulties of over-production are beginning to be felt.

The commercial organization, with its sales ill-regulated, its forwardings badly distributed and poorly graded, and the frauds of its monopolizers, tends to depreciate the produce and combines with the already existing causes to produce a distinct state of uneasiness, which is considered by some as a veritable crisis in Valencian citrus growing.

It should be remarked that in the other orange-growing districts the conditions of the market continue to be highly favourable; indeed, in the east coast region itself, Murcia and Alicante continue to increase the number of their plantations and the size of their export figures, and the growers make no such complaints as do those in Valencia and Castellón. It is evident that the over-production is confined to these two provinces.

My idea is that the facts just mentioned give evidence of a marked, but not irremediable, crisis. The farmers' association is developing rapidly in the most affected provinces, and the organization of sales and exportation will easily be accomplished by the cooperative societies now in progress of formation, and the Government seems inclined to encourage the movement. The control of orange pests is already efficacious, thanks to the generalization of the hydrocyanic acid method. If these improvements can be further added to by measures for putting an end to the disorder of the new and generally badly situated plantations, orange growing in Spain will recover its former prosperity. Further, the development of the utilization of the secondary products (orange flowers, citric acid, bark), still in its infancy, will furnish a new source of profit, which the associations will find it easy to exploit.

It is evident that for this crop, as for all others, the future is uncertain, and a constant watch must be kept on competition so as to see how best to override it. For many years Spain has had to compete with other European countries. In other parts of the world thousands of acres of oranges and other citrus trees are being planted every year. This future competition (to which indeed all other European crops are subject) must be provided against by perfecting methods, continually adapting them to local requirements and turning out the type of fruit liked by the consumers.

Calf Rearing on the Emulsion System, with Coconut Butter as Cream Substitute.

by

Dr. Paul Schuppli

Director of the School of Alpine Economy
at Grabnerhof, Styria, Austria.

With the rising prices of milk and the better methods of turning the milk supplies to account, it is natural that an attempt should be made by calf-rearers to discover effectual substitutes for this substance. Many, indeed most, of these substitutes have proved useless and do not replace milk in at all a satisfactory manner. Although a certain measure of success can be obtained by giving a calf milk only for a short time after its birth, and rearing it subsequently with the assistance of every possible feed, provided the greatest care and a certain amount of money is expended; yet the results are not wholly as satisfactory as if the young animal had been supplied for a longer time with milk, even if skim milk is gradually substituted for whole milk. According to this method, a heifer calf would be given milk for about 5 months, *viz.* whole milk for 2 months, this being gradually replaced by skim milk during 2 months, and skim milk being fed alone for the last month. In the case of a bull calf, milk is given for 8 months: whole milk for 2½ months, a mixture of whole milk and skim milk for 4 months and skim milk alone for 1½ month. The guiding principle is never to give the calf a large quantity of milk, but to give it over a considerable period. The expense entailed is not great and the result far more satisfactory than if a large quantity is given at first and soon discontinued. The result of the last-mentioned system is to produce a fat animal at first, *i. e.* one that has a large amount of reserve substances, which are of little use to a calf. On the contrary, if the over-feeding is continued throughout most of the rearing period, the result is a direct decrease in the milk yield. When the milk rations cease and the calf is fed on non-fatty substances, it loses the fat it put on when fed on milk and becomes pot-bellied (*Heu-bauch*). The aim of the breeder in rational feeding is to supply the young beast with such food as will enable it to use all its energy for the purpose of its perfect development; or in other words, the growing power of an animal must be continually brought into play by means of its food, so that its growth gets no check.

In 1905, at the Dairy Congress in Paris, the writer became acquainted with the system in vogue inFrance of replacing milk fat by another animal fat in calf-rearing and fattening. Encouraged by the success of the method, he made experiments in the same direction. In order to ensure satisfactory results and to obtain as much difference in cost as possible between milk fat and its substitute, he selected for the latter a vegetable fat, namely that obtained from coconut; this fat has also been used for cooking purposes as a butter substitute. The cheapest fats are those obtained from plants. Coconut fat also contains 99 per cent. pure fat, which is not usually the case with other similar substances; adulteration is so far out of the question, as no cheaper raw substances can be found. By mixing 35 grams in about 1 litre of skim milk, a milk with 3½ per cent. of fat was obtained, *i. e.* one corresponding to the average milk used in rearing, for it is of no special advantage to give calves milk which is extra rich in fat.

In order to make a suitable mixture, the fat and skim milk are heated to 60° C. and passed through an emulsion drum. Emulsion machines of this kind are supplied by the firm of E. Bazzi and Co. (Engineers) of 4 Viale Venezia, Milan, Italy, and Messrs. R. A Lister and Co., Dursley, England. The object of both these machines is to obtain a mixture of skim milk and of melted plant fat suitable for feeding; the mixture must not be allowed to stand, but should be made fresh each time, as the fat rises like that of whole milk, and thus each calf does not receive the necessary proportion of fat and skim milk. It is not possible to mix the plant fat and skim milk with a hand apparatus, and all attempts which have been made to do this have proved unsuccessful. It has been shown by experience that the use of so-called emulsion-milk is apt, under certain circumstances, to cause scour; but this can be largely be avoided by pasteurizing the skim milk.

The feeding is done according to the accompanying tables (pp. 169 and 170).

These tables are taken from "Leitfaden der Wartung und Plege des Milchviehes" by Dr. Paul Schuppli, published by Messrs. Parey, Berlin.

The calves are usually fed three times a day for the first few days. After a week, this is gradually reduced to twice, so that the daily amount given in the tables is fed in two portions, early in the morning and in the evening. It should be mentioned that the calves are given hay when they are a week old, but no water till the daily ration of emulsion and skim milk begins to decrease, and then 1¼quart of water is substituted for every quart of milk which is withheld; it is however always given after the dry food, instead of before, as was the case with the emulsion milk. When the calf is 8 weeks old, it is given oats and wheat bran; the ration for the heifer calf is 1 lb. each of oats and wheat bran, until the milk is withheld altogether; while for bull calves, the amount is 3 lbs. of the two together. Towards the end of the first year, this ration is gradually lessened and finally ceases in the case of the heifer calf, but the bull calf is given oats and bran for over a year. The best food for the heifer calf is not one which influences milk production, for it is only the first stage of development which should be taken into consideration.

TABLE I.

Bull Calf.

No. of days	Quarts *) per day: Milk from its dam	Quarts *) per day: Whole milk	Quarts *) per day: Emulsion milk	Quarts *) per day: Skim milk	Total amount (gallons): Milk from its dam	Total amount (gallons): Whole milk	Total amount (gallons): Emulsion milk	Total amount (gallons): Skim milk
10	6	—	—	—	13 1/4	—	—	—
7	—	7	—	—	—	10 3/4	—	—
2	—	7	1	—	—	3	1/2	—
2	—	6	2	—	—	2 3/4	1	—
2	—	5	3	—	—	2 1/4	1 1/4	—
2	—	4	4	—	—	1 3/4	1 3/4	—
2	—	3	5	—	—	1 1/4	2 1/4	—
2	—	2	6	—	—	1	2 3/4	—
2	—	1	7	—	—	1/2	3	—
14	—	—	9	—	—	—	27 3/4	—
28	—	—	10	—	—	—	61 1/2	—
35	—	—	8	2	—	—	61 1/2	15 1/2
14	—	—	7	3	—	—	21 1/2	9 1/4
14	—	—	5	4	—	—	15 1/2	12 1/4
14	—	—	3	5	—	—	9 1/4	15 1/2
14	—	—	2	6	—	—	6 1/4	18 1/2
14	—	—	—	8	—	—	—	24 1/2
21	—	—	—	6		—	—	27 3/4
21	—	—	—	4	—	—	—	18 1/2
220				Total . . .	13 1/4	23	215 1/2	141 3/4

*) In this part of the table the litre is taken as equal to the quart, so as to avoid fractions; to obtain the exact amounts given by the author, subtract one-eighth from the figures: thus 10 quarts becomes 8 3/4, and 8 becomes 7.

The following table gives the results which have so far been obtained with calves reared on emulsion milk at the Grabnerhof School of Alpine Economy from 1905 to September 1912.

	Number —	Average increase per calf per day lbs.
Murboden heifer calves	90	1.63
Murboden bull and steer calves	78	2.05
Pinzgau heifer claves	44	1.70
Pinzgau bull and steer calves	46	1.92
Total number of calves	258	1.82

TABLE II.

Heifer Calf.

No. of Days	Quarts *) per day: Milk from its dam	Quarts *) per day: Whole milk	Quarts *) per day: Emulsion milk	Quarts *) per day: Skim milk	Total amount (gallons): Milk from its dam	Total amount (gallons): Whole milk	Total amount (gallons): Emulsion milk	Total amount (gallons): Skim milk
10	5	—	—	—	11	—	—	—
7	—	6	—	—	—	9 ¼	—	—
2	—	6	1	—	—	2 ¾	½	—
2	—	5	2	—	—	2 ¼	1	—
2	—	4	3	—	—	1 ¾	1 ¼	—
2	—	3	4	—	—	1 ¼	1 ¾	—
2	—	2	5	—	—	1	2 ¼	
2	—	2	6	—	—	1	2 ¾	—
2	—	1	7	—	—	½	3	—
14	—	—	8	—	—	—	24 ½	—
14	—	—	6	2	—	—	18 ½	6 ¼
14	—	—	5	3	—	—	15 ½	9 ¼
14	—	—	3	5	—	—	9 ¼	15 ½
14	—	—	2	6	—	—	6 ¼	18 ½
14	—	—	—	8	—	—	—	24 ½
14	—	—	—	6	—	—	—	18 ½
14	—	—	—	4	—	—	—	12 ¼
7	—	—	—	2	—	—	—	3
150				Total . . .	11	19 ½	86 ¼	108

*) See note under preceding table.

They were, as is seen, relatively satisfactory: not much more can be required for producing cows of good performance which are healthy and possess good powers of resistance.

Stress should be laid on the fact, that a hardening system was carried out simultaneously with the prescribed method of rearing. Consequently, the growth of the animals was less in proportion than if they had been stable-reared, but the often greatly increased growth which sometimes occurred in spite of similar feeding is thus explained. When they are a fortnight old, the calves are taken every day in winter to the exercising ground, which has a sunny aspect but no special shelter; in summer, they are turned into a pasture, where they at once begin accustoming themselves to a grass diet. Of course, they are still fed in the shed as before and the same amount of bulky food is given till they are able to obtain sufficient grass, when of their own accord they refuse the corresponding amount of dry fodder. In this way, the grazing period is got over without scouring or much loss of weight. The only precaution that is taken in bad weather consists in rubbing down the very young calves with straw as soon as they return to the shed, to prevent chill.

The chief advantage in emulsion feeding is that the same results are obtained as with a mixture of whole and skim milk and at far less cost.

Of this the figures in Table IV (next page) give the best proof.

Remarks on Table IV.

1) The price of whole milk is taken at 18 heller per litre (8¼ *d.* per gallon) on account of the general rise in the price of milk.

2) The cost of preparing 25 gallons of emulsion milk is reckoned as follows:	*s*	*d*
24½ gallons of skim milk at 2¼*d.*	4	7
(the 2 quarts lacking are made up by the coconut fat, of which 8 3/4 lbs. will make the total up to 25 gallons).		
8 3/4 lbs. of coconut fat at 6¼*d.* per lb. (including carriage and preparation)	4	6 3/4
Cost of preparing 25 gallons of emulsion milk (including depreciation on machine)		3
Cost of 25 gallons of emulsion milk	9	4 3/4

Therefore one gallon will cost 4½*d.*

3) A fifteen years' average at the Grabnerhof School of Alpine Economy gave 207 stall-feeding days and 158 grazing days. The costs of the stall feeding and grazing days for heifer and bull calves are based on the experience obtained there.

4) The straw requirement is small, owing to the shortness of the stalls and the depth of the drainage gutter: the amount allowed is enough for calves up to a year old.

5) A man who milks 16 cows receives:	£	*s*	*d*
Wages: per month 26*s.* 8*d.*, or per year	16	0	0
Board and lodging: per month 23*s.* 4*d.*; per year	14	0	0
Total	30	0	0
The attention for one cow therefore comes to	1	17	6
Reckoning one-third for a calf		12	6
6) The cost of stabling for one cow (including food rooms, manure pit and water troughs) comes to about	33	6	8
With interest at 4 % and upkeep at 2 %, the cost per cow per year will be	2	0	0
Reckoning one-third for a calf		13	4
7) Light and veterinary expenses are reckoned for a cow at		5	0
For a calf		1	8

8) The management of breeding must certainly be included in the cost of rearing, on the assumption that every breeder will incur certain expenses for the useful purposes of performance tests and selection of stock, and will also pay a subscription to his Association.

9) The value of the dung is estimated according to the amount produced, and it is assumed that there is a suitable pit for storing it.

In these rearing expenses the value of the calf is not included, as this depends on its breed, descent, etc., and is therefore very variable, as is

TABLE IV.

Substance	Unit price		For a Heifer Calf				For a Bull Calf			
			Reared on whole milk, and some skim milk		Reared on whole milk, emulsion milk, and skim milk		Reared on whole milk, and some skim milk		Reared on whole milk, emulsion milk and skim milk	
			Quantity		Quantity		Quantity		Quantity	
		s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Whole milk	1 gallon	— 8 ¼	166 gall.	5 13 5	30 gall.	1 0 8½	333 gall.	11 6 9½	36 gall.	1 4 9
Emulsion milk	1 gallon	— 4 ½	—	—	72 gall.	1 7 5	—	—	215 gall.	4 1 8
Skim milk	1 gallon	— 2 ¼	80 gall.	— 15 2	108 gall.	1 0 5	149 gall.	1 8 0	141 gall.	1 6 10
Oats	1 cwt.	8 6	220 lbs.	— 16 8	220 lbs.	— 16 8	264 lbs.	1 0 0	264 lbs.	1 0 0
Wheat bran	1 cwt.	5 1	220 lbs.	— 10 0	220 lbs.	— 10 0	264 lbs.	— 12 0	264 lbs.	— 12 0
Salt	1 cwt.	5 11	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½	2 ¼ lbs.	— — 1½
Stall-feeding days	1 day	bull — 2 heifer — 2 ¼	207 days	1 14 6	207 days	1 14 6	207 days	1 18 0	207 days	1 18 0
Grazing days	1 day	bull — 1 ½ heifer — 1 ¼	158 days	— 15 9½	158 days	— 15 9½	158 days	— 18 5	158 days	— 18
Straw	—		—	— 4 2	—	— 4 2	—	— 4 2	—	— 4 2
Attendance	—		—	— 12 6	—	— 12 6	—	— 12 6	—	— 12 6
Rent of shed	—		—	— 13 4	—	— 13 4	—	— 13 4	—	— 13 4
Light and vet.	—		—	— 1 8	—	— 1 8	—	— 1 8	—	— 1 8
Breeding management	—		—	— 12 6	—	— 12 6	—	— 12 6	—	— 12 6
TOTAL	—		—	12 9 10	—	9 9 9½	—	19 7 6	—	13 6 0
To subtract for dung	—		—	1 9 2	—	1 9 2	—	1 13 4	—	1 13 4
Net expenses	—		—	11 0 8	—	8 0 7½	—	17 14 2	—	11 12 8

also the danger of loss. The expenses must be understood to refer to a calf that is safely reared.

The difference in cost between rearing calves on whole and skim milk compared with the expense of using emulsion milk as well as whole and skim milk is, as the above table shows :

For a heifer calf	£3
For a bull calf	£6 1*s*. 6*d*.

Thus the advantage is on the side of the emulsion-milk system, and as the saving is very considerable, the trouble and labour entailed in making the emulsion milk is fully repaid.

It still remains to be shown that the final weight of cows reared on this emulsion is not inferior to that of animals raised in the ordinary way. There was no difference in the final weight of five-year-old Murboden and Pinzgau cows reared according to these two systems at Grabnerhof. The weight of 19 Murboden cows in 1906 averaged 1302 lbs.; in 1911, 43 cows averaged 1346 lbs., and amongst the latter were 12 animals which had been reared on emulsion. Thus, in this case, the final weight had increased rather than the reverse.

The emulsion system is certainly troublesome and requires great exactitude, but as the foregoing statements have shown, it is remunerative and much to be recommended. This has been proved by eight years' experience at Grabnerhof, and is corroborated by the experience gained on other estates.

Measures adopted in Sweden to spread Book-keeping among Farmers

by

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Up to recent years, when the measures adopted in Sweden to promote book-keeping among farmers were discussed, the only one that could be mentioned was the instruction given in this subject in the higher and lower schools of agriculture. It is true that some associations of rural economy, among others that of the province of Malmöhus, had since 1880 published forms of book-keeping adapted to the requirements of small and medium farmers. But it was only with the introduction of prizes for small farms that book-keeping was more generally introduced. For the last twenty years, every year and in each province an examination is made of small properties (up to 30 acres) worked by their owners, and the most deserving are given rewards of which there are three classes.

It was established in 1902 by the Statutes regulating these rewards that "the farmer who for his farm has received a prize in money cannot be awarded a second prize for the same farm unless he submits to the Commission of prizes his notes drawn up according to the forms fixed upon by the Direction of Agriculture, and collected by him since the time at which the first prizes were distributed." Thanks to this method of obliging farmers who wish to compete for the State prizes for small farmers to keep their books, a well regulated system of book-keeping has penetrated very widely among the more advanced small farmers.

In the larger farms the Italian system of book-keeping by double entry is adopted almost without exception; among medium sized farms it is also very frequent to find that book-keeping, at least by single entry, is practised; but with the exception of the small farms that have taken prizes, the practice of book-keeping has spread only to a trifling extent among small farmers. Nevertheless of late years it has been observed that the interest in book-keeping has increased in a most satisfactory manner among Swedish farmers, and it may be added that the small and medium farmers have not been less keen than the others. For this fact there are several reasons. Thus, the ever increasing intensity of farming has caused the need of control to be more sensibly felt. The spread of Control Associations (at the beginning of 1912 Sweden possessed upwards of 700 associations for the control of dairies and in general also of pig rearing concerns) has contributed a good deal to a better understanding of the economic importance of agricultural book-keeping. Besides by *the law of* 1910, *which establishes taxation on capital and on income*, agricultural book-keeping has, to a certain extent, been rendered compulsory in Sweden, as, according to this law, the net income of the farm is the basis for taxation by the State, and as soon as the assessed value of an estate exceeds 25 000 crowns (£1357) the farmer must be prepared to confirm the correctness of his individual declaration by his well-kept books.

Owing to the prominence thus given to this question, the campaign to encourage book-keeping especially among small and medium farmers has been carried on with renewed energy. Among the measures lately adopted in order to extend the movement among practical farmers the following may be mentioned:

1. *The creation of agricultural book-keeping bureaus.* — In 1911 and 1912 bureaus of agricultural book-keeping have been established in several provinces by associations of rural economy and by other associations formed especially for the purpose. In order to explain the organization of these bureaus the following extracts are given from the Statutes of the agricultural book-keeping association of the province of Malmöhus, which has its seat at Malmö (at present this association, which numbers about 100 members possessing among them a total of 14 820 acres, is the most important):

"The Association is organized as an economic association without personal liability, and a representative of the Society of rural economy of the province has a seat on its committee.

"The book-keeping bureau established by the Association has the following objects in view: keeping and closing complete farming accounts based on the reports or yearly journals sent by farmers; auditing accounts; making inventories; drawing up individual declarations; distributing forms for book-keeping; and compiling, from the material which it receives, reports of a certain importance for elucidating economic questions of general interest."

"As for the diffusion of book-keeping, this is divided into three principal categories: A, simple agricultural book-keeping; B, more extended book-keeping, with special accounts for the various branches of the farm; to which is added for C a detailed control of the returns of the various crops."

The subscription to be paid for the keeping of books is based on the time spent for each member, and the minimum fee for closing accounts is, for the three types of book-keeping above mentioned, 20, 40 and 60 crowns (£1 1s. 8*d.*, £2 3s. 4*d.* and £3 5s.) respectively. The sum to be paid for keeping the books has varied up to the present from 0.50 to 2 crowns per hectare of field (2½*d.* to 10½*d.* per acre) according to the size of the farm and the more or less complete system of book-keeping.

This association works also in connection with the control associations; the assistants of the latter assist the farmers in keeping their current accounts, after which the control and closing operations are done at the bureaus.

2. *The appropriations granted by the State and the Associations of rural economy for the spread of the practice of book-keeping among small farmers.* — According to a resolution voted by Parliament in 1911 a sum of 15 000 crowns (£900) is granted every year for distribution among the small farmers, who apply to the book-keeping bureaus approved by the State and by the association of rural economy. This subsidy is paid to the bureaus to which the farmers have entrusted the closing of their accounts, and it amounts to 15 crowns (16s. 3½*d.*) during four years for each account closed in the course of the year, for farms not exceeding 185 acres of arable land; it is given on condition that the interested association of rural economy pays an equal sum.

3. *Special courses of book-keeping for farmers.* — Two years ago, on the initiative of the associations of rural economy and of some private persons, a great number of courses of book-keeping were organized throughout the country for the benefit of farmers. These courses, which last only a few days, have generally been well attended. Further, instruction in simple agricultural book-keeping is frequently a part of the programme of the complementary schools attached to the primary schools in the country.

An active campaign is thus being carried on in several ways throughout the country, with the object of spreading the practice of agricultural book-keeping, and it is to be hoped that, with time, this work will be rewarded by success.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

92 - **The Encouragement of Flax, Hemp and Olive Growing in France.**

Encouragements à la culture du Lin, de la Chanvre et de l'Olivier en France. — *Journal Officiel de la République Française*, Year XLIV, No. 344, p. 10576. Paris, December 18, 1912.

The law of April the 9th 1910 allots to cultivators of flax and hemp, from the commencement of the financial year of 1910 and for a period of six years, prizes to an annual amount (including expenses of verification and control) not exceeding 2 500 000 fr. (£100 000), and which will be allotted, within the limits of this sum, in proportion to the extent of the areas sown, the minimum extent being 20 acres, the sum at no time exceeding about £1 per acre (60 fr. per ha.). The amount of this prize is fixed for the financial year of 1912 at £1 per acre.

By a ministerial decree of December the 16th 1912, the amount of the prize for the cultivation of the olive allotted by the law of April the 13th 1910 (1) is fixed for the financial year of 1912 at 5*s.* 6*d.* per acre (17 fr. per ha.).

93 - **Regulations for Cattle Sales on a Large Scale in the La Villette Market, Paris.**

Réglementation des ventes en gros sur le marché aux bestiaux de la Villette. — *Journal Officiel de la République française*, Year XLIV, No. 344, pp. 10575-10576. Paris, December 18, 1912.

By the decree of the 27th of June, 1912, a Commission was appointed at the Ministry of Agriculture for the purpose of considering the amendments to be introduced into the decree of the 22nd of January, 1878, regarding sales on a large scale in the Paris markets, in order to enable cattle to be purchased at first hand in the market of La Villette.

The members of the Commission were nominated by a decree of the 16th of December, 1912.

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(1) See No. 2666, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*).

94 – **Horticulture in the Hungarian Budget for 1913.** (Extract from the statement on the budget of the Royal Hungarian Ministry of Agriculture.).

Gartenbau, Obstbau und Baumzucht in dem Staatsvoranschlag für das Jahr 1913. — *Volkswirtschaftliche Mitteilungen aus Ungarn*, Zur Orientierung des Auslandes herausgegeben vom königl. ung. Handelsministerium, Year VII, Part X, pp. 1438-1444. Budapest, October 1912.

Under the head of personal expenses of class 26, chapter XX (horticulture) the following sums were allocated:

For 1912	£ 6 350
For 1913	£12 635
Increase for 1913 . . .	£ 6 285

Owing to the limited means at the disposal of agriculture for this purpose, the Minister of Agriculture has decided to rent fields near towns, industrial establishments and watering-places, for the growth of vegetables and flowers, and to give spare time employment to children who wish to improve in horticulture, instead of costly lectureships, which will in future only be established in a few important places.

At the same time, coloured photographs of plants, fruits, etc., will be prepared, for the instruction of the children during the winter by means of lantern projections. These practical meetings willl be continued for a year or two by the ordinary agricultural staff, till the schoolmasters or other State employés have qualified for the continuation instruction of the children.

Among temporary expenses, £1667 have been appropriated under the heading: "for publishing market prices of horticultural produce, and for the organization of sales of the same." This expenditure is amply justified by the state of the markets, which clearly show the lack of information concerning buying and selling.

To remedy this state of affairs in the future, an organization will be created under the Ministry of Agriculture, consisting of employés of this department, reporters and persons who have gained some State certificate in horticulture; by means of this, the trade will be able to have information on the market prices of the whole country, and the central station will have a sure foundation for the rational introduction and extension of certain branches of production, while preventing its happening that the demands made by foreign countries cannot be acceded to owing to lack of information as to the provenance of goods.

In connection with this question, the sale of the products must be seen to, especial care being taken that the small growers are not too much at the mercy of middlemen. Small growers must be able to sell their goods to reliable salesmen, and must be instructed in grading and packing. The realization of this double purpose is only attainable by material State assistance, for the necessery guarantees can only be obtained — until such time as commercial confidence in this organization is established — by payments in hard cash.

The Royal Hungarian Ministry of Agriculture wishes to assist this commercial enterprise by appointing packers, and by the grafting of fruit trees by State agents in cases where obstacles to the activity of the organization are formed by the lack of uniformity in the fruit trees. It also wishes to bear the expenses of organizing fruit markets where the grading and packing of the products purchased in advance are carried out at the grower's.

For starting and helping market-gardens, £833 were voted in 1913.

The organization of such market-gardens was taken up by many municipalities, communes and corporations.

At the same time, to obtain greater and more lasting results, it is necessary to support the production of the types of fruits whose market value is increasing, and for this purpose existing centres of production should be encouraged and fresh ones started.

With regard to the improvement of quality, which necessitates the creation of Experiment Stations, the State will undertake to bear considerable expense; it will also see to the formation of new central stations, for proprietors can only start on market gardening when there are examples to follow and success is plainly evident.

The State should therefore organize the whole production by starting undertakings cheaply, and arranging for their direction by competent State officials who will teach the people.

For starting and assisting establishments for horticultural seed improvement, the budget has allocated £833.

The production of agricultural seeds has been greatly encouraged by the company for the "production of Hungarian agricultural seeds," which also undertakes the growing of some vegetable seeds. The activity of this society, however, is directed only to exportation.

To do away with the disadvantages of getting the seed required at home from abroad, the first thing would be to set up small establishments for seed-growing on plots surrounded by small farms. The results obtained would be made known among the growers, who would then themselves take part in it.

The production of seed might be increased if the director of the chief trial station were to undertake the giving out of reliable information, and if the purchase of the seed grown were guaranteed in advance, as the best firms of seed merchants have declared they would be willing to do.

In spite of the favorable climatic conditions, which allow of rapid ripening, and the conditions of the soil, which encourage quick multiplication, the growing of hyacinths and tulips and other bulbs is still very limited; steps are being taken to increase this branch.

For 1912 £6000 were allotted, and for 1913 £22 500; the increase of £16 500 is destined for new buildings, greenhouses, etc., in the establishments.

95 - Growth and Usefulness of the Publication Work of the U. S. Department of Agriculture.

WILSON, JAMES (Secretary of Agriculture) in *Report of the Secretary of Agriculture, 1912*, pp. 115-117 and *passim*. Washington, 1912.

Secretary Wilson concludes his record of 16 years at the U. S. Department of Agriculture; this period began in 1897 with a yearly farm production worth $4 000 000 000 and ends with $9 532 000 000, and the crop produced in 1912 has been the greatest in the history of the United States.

Along with this increase, the number of persons employed by the department grew from 2 444 in 1897 to 13 858 on July 1, 1912, and the appropriations for the department increased from $3 272 902 for the fiscal year ending June 30, 1898, to $24 743 045, for 1913. Secretary Wilson states that in wealth produced and conserved during these 16 years the U. S. Department of Agriculture has returned more than ten times these appropriations; and that the publication work of the department is an unerring indication of its growth and usefulness.

Evidences of growth and usefulness. — The records of the Division of Publications, in which the publication work is centralized, show that in 1897 the mail requests for publications barely exceeded 500 letters per week, while during the past year, the weekly mail has exceeded 52 000 letters, or more than 100 letters for each one received at the earlier date.

With a printing fund of $116 888, the different publications printed in 1897 were 424, and the editions aggregated 6 541 210 copies; in 1912, with an appropriation of $470 000, the different publications were 2110, aggregating 34 678 557 copies.

The work of the Division of Publications reflects, and it is assumed must always represent, the activity of the other offices of the department. All the information acquired in the several bureaus by the means at their command finds its expression necessarily in the form of publications which pass through this office. Every enlargement of the scope of the work covered by any other office, especially the adoption of entirely new lines of work, involves an addition to the work of the Division of Publications.

The appropriations for the fiscal year 1897 disbursed by this division for salaries, supplies, etc., amounted to $44 367, while for 1912 they were $209 960, an increase of nearly 475 per cent. In 1897, the number of employees in the division was 61, and in 1912 aggregated 197, an increase of nearly 225 per cent.

Number of copies distributed. — During the 1897-1912 period over 225 000 000 copies of publications have been distributed to those engaged or interested in farming. Of this number slightly more than 88 000 000 copies were Farmers' Bulletins. Although the series of Farmers' Bulletins was begun in 1889, only about 5 000 000 copies had been issued by 1897, and those distributed during that year amounted to less than 2 000 000 copies, while during the year 1912 over 10 000 000 copies were distributed. Previous to the period under discussion only 41 different Farmers' Bulletins had been prepared, and at present there are 506 separate pamphlets discussing nearly every phase of modern agricultural operations.

It is stated that no other Government issues as many publications as does the United States, and that no executive department of the U. S. Government issues as many publications as does the U. S. Department of Agriculture in performing its function of acquiring and disseminating useful information in regard to agriculture. But the rapid increase in the population of the country and the great popularity acquired by the documents of the U. S. Department of Agriculture have so augmented the demand that the department has not in recent years had an appropriation that permitted the printing of a sufficient number of copies to meet the demand.

The U. S. Congress, however, has provided a solution of the problem by authorizing the Superintendent of public documents to reprint and sell at a nominal price such documents as may be required. The enormous increase in the sale, by that official, of the U. S. Department of Agriculture publications is surprising when it is remembered that millions of copies are distributed free, both by the Department of Agriculture and by Members of Congress. During the last fiscal year 171 866 copies were sold by the superintendent of public documents, for which he received $16 428.

The magnitude of the work of disseminating the vast fund of information so systematically sought and so scientifically verified is commensurate with the enormous advance made in the application of scientific knowledge to practical agriculture of the United States — a result to which the U. S. Department of Agriculture has contributed no small share. The improved conditions on farms, the increased yields of crops, the improved breeds of live stock, and the new varieties of fruits resulting from the labors of the U. S. Department of Agriculture as detailed and explained in its publications have added many millions to the wealth of the American Nation.

RURAL HYGIENE

96 - Yellow Fever and Mosquitos.

HOWLETT, F. M. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 363-367. Calcutta-London, 1912.

India has so far been immune from yellow fever; but there is always the possibility of its introduction. The probability that the disease if once introduced would spread with any rapidity depends on the presence of certain mosquitos.

The organism which causes the fever is so minute that it has not yet been possible to isolate it, but it is known that the disease is propagated from a patient suffering from yellow fever to a healthy person by the bite of a mosquito known as *Stegomyia fasciata*. It is a "domestic" mosquito, and is generally found in or near human dwelling places, while it breeds in almost any small casual accumulation of water (such as sardine tins, broken pots, the cut ends of bamboos, etc.). Unfortunately it is not yet known whether the other species of the genus *Stegomyia* are harmless or whether they must be regarded as dangerous. Judging by analogy with the case of *Anopheles* mosquitos and malaria, it seems most likely that some or all of the other species of *Stegomyia* might be found capable of carrying yellow fever.

In the large Indian sea-ports, and particularly in Bombay and Calcutta, *S. fasciata* is a common insect. On the other hand, in the inland districts they are by no means abundant, and though widely distributed they are represented only by a few scattered individuals, while *S. scutellaris* is very common.

It is evident from this that if yellow fever were introduced into the country, and *S. fasciata* were the only carrier, the disease would be limited to the coast districts and sea-ports; but if *S. scutellaris* is also a carrier it might spread infection all over the country.

The distribution of the different species of *Stegomyia* in the larger sea-ports is now being ascertained with accuracy by a number of medical officers, and this investigation has particularly in view the seasonal occurrence and normal breeding-places of *S. fasciata*.

S. scutellaris breeds mostly in the small accumulations of water in the cut ends of bamboos, or in trees. The adult *Stegomyia* perish during the winter, while their eggs survive. These eggs are laid in water which at the beginning of the dry weather soon evaporates, but the eggs live on even if left dry, until the coming of rain and a proper temperature enable them to hatch. It is believed, though it is not yet wholly confirmed, that yellow fever can be conveyed by the offspring of an infected mosquito as well as by the parent itself. Therefore the plan advised by the writer aims at destroying all the hibernating eggs, suppressing as far as possible the casual natural breeding places, and at the same time providing artificial ones in which at suitable times all the eggs and larvæ might be destroyed.

97 — The Copra Itch.

1. — CASTELLANI, ALDO.: Note on Copra Itch.

2. — HIRST, STANLEY.: Report on the Mite causing Copra Itch. *The Journal of Tropical Medicine and Hygiene*, Vol. XV, No. 24, pp. 374-375, 2 figs. London, December 16, 1912.

1. — Already for some years past, the writer had observed that the persons working in the copra mills were affected by a peculiar eruption, which extended from the hands to the arms, legs, and trunk, but never to the face. The eruption much resembles scabies in its external appearance, except that no burrows or cunicula are present. It is due to quite a different parasite, which Mr. Stanley Hirst has named *Tyroglyphus longior* var. *castellanii*. This acarus was met with on the epidermis of the patients and in the copra dust. It does not appear to make true burrows, but seems to induce dermatitis in the same manner as *Pediculoides ventricosus* Newport, which lives in diseased cereals and produces an eruption in persons handling the latter.

The writer reproduced the disease experimentally. The eruption has very little or no tendency to heal spontaneously, unless the patient abstains for some time from his work in the copra mill. Beta-naphthol ointment (5-10 per cent.) has proved a very useful remedy.

2. — Mr. Stanley Hirst gives a description and figures of the parasite in question and mentions that according to Michael ("*British Tyroglyphidae*", Vol. 2, pp. 123-131) *T. longior* has a very wide distribution in Europe and is found on most kinds of dried or preserved animal and vegetable matter, especially upon dried provisions.

98 - Experiments with Crude Carbolic Acid as a Larvicide in Britsh Guiana.

WISE, K. S., and MINETT, E. P. in : *The Journal of Tropical Medicine and Hygiene*, Vol. 15, No. 23, pp. 358-359. London, December 2, 1912.

Floating larvicides, such as paraffin, either in its pure or crude state, and even heavy petroleum oil, are practically useless in British Guiana for, owing to the strong wind always blowing, and the absolutely flat open nature of the soil, such substances are quickly blown away to one side and evaporated before their asphyxiating properties come into play. In the case of large areas of water, such as drainage trenches, many larvæ can be destroyed by keeping the water well stocked with the small fish known locally as "Cockerbellies" and clearing away all floating vegetation as far as possible, but these fish are often unable to gain access to the many small depressions in the land holding temporary water. In these cases and under similar conditions in the laboratory the writers experimented with crude carbolic acid, using the larvæ of *Culex fatigans*, *Stegomyia fasciata*, other Culicidae, *Taeniorhynchus*, *Cellia albipes*, and *C. argyrotarsus*. Under natural conditions, the larvæ in most of the small pits when treated with carbolic acid were seen to die in about an hour, but in the case of the pupæ the time was much longer, frequently as much as 24 hours.

A dilution of 1 part of crude carbolic acid in 20 000 is completely efficacious. Purified carbolic acid acts more rapidly, but is not efficacious in such high dilutions; further, it evaporates more quickly. The water treated in this manner is not harmful to animals, but they do not drink it readily on account of its tarry odour and blackish colour.

The writers have observed that, owing to its containing some constituents insoluble in water, crude carbolic acid does not lend itself to being sprayed over large areas with a Mackenzie spray, but by constantly stirring the mixture in a bucket during the process a fairly satisfactory distribution can be obtained.

When a large area of ground containing a number of small holes such as foot prints, has to be treated, it has been found more satisfactory to use substances which mix more easily with water, such as cyllin, chloronaphtholeum, or Sanitas okol, although the expense is much greater.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

99 - Agricultural Continuation Schools in Belgium.

Cours d'Agronomie aux adultes. — *Ministère de l'Agriculture et des Travaux publics, Bulletin de l'Agriculture et de l'Horticulture*, Year II, No. 4. Bruxelles, 1912.

During the winter months 1912-13 agricultural continuation-school instruction will be imparted in 401 communes, and rural housekeeping courses will be held in 143.

They are distributed in the various provinces as follows:

Province —	Communes with continuation schools	Communes with housekeeping courses
Antwerp	28	5
Brabant	45	13
West Flanders	78	7
East Flanders	50	31
Hennegau	47	11
Liège	33	3
Limburg	48	44
Luxemburg	40	23
Namur	32	46

Of the 190 teachers who conduct the boys' continuation schools, 63 are elementary school teachers and inspectors, 52 agricultural teachers (ingénieurs-agronomes), 22 agricultural travelling lecturers (conférenciers agricoles), 29 professors and veterinary surgeons, 24 various (farmers, clergymen, etc.). The housekeeping courses are held by 35 lady teachers, mostly teachers in housekeeping schools or travelling housekeeping schools.

AGRICULTURAL SHOWS AND CONGRESSES

100 - Central Agricultural Shows in France in 1913.

Avis relatif aux concours centraux agricoles en 1913. — *Feuille d'Informations du Ministère de l'Agriculture*, Year XVII, No. 51, p. 2. Paris, December 24, 1912.

By the decree of December 18, 1912, the Minister of Agriculture has made known his decision that 8 central agricultural shows shall be organized in 1913 in the following towns: Antibes, Châteauroux, Epinal, Evreux, Gap, Montauban and Nantes. The Antibes competition will take place from March 10 to 16, 1913. The programme of this exhibition can be obtained by those interested from the Ministry of Agriculture and the prefectures of the Mediterranean district. The dates of the other shows will be announced later.

101 - Packing Industries' Exhibition in Paris, July to October 1913.

Exposition d'Emballages à Paris, Juillet-Octobre 1913. — *La Petite Revue agricole et horticole*, Year 19, No. 434, p. 6. Antibes, January 12, 1913.

From July to October 1913, there will be held at the Grand Palais of the Champs Elysées the first International Exhibition of packing and allied industries, organized by the "Syndicat National et Mutuelle-Transport réunis."

For all further information, apply to the Administration, 28 Rue Biscornet, Paris 12, or to the Commissariat général, Bourse de Commerce, N°. 63.

102 - Agricultural Shows in Great Britain in 1913.

Society holding Show.	Date	Place
Shire Horse	25-28 February	Islington (London)
Hackney Horse	4-7 March	»
Hunters' Improvement	11-13 March	»
Polo and Riding Pony	14-15 March	»
Bath and West and Southern Counties . .	27-31 May	Truro
Royal Counties	10-13 June	Windsor
International Horse Show	20 June - 1 July	Olympia (London)
Royal Agricultural Society of England . .	1-5 July	Bristol
Highland and Agricultural Society of Scotland	8-11 July	Paisley
British Dairy Farmers	21-24 October	Islington (London)
Birmingham Cattle and Poultry Show . . .	29 Nov.-4 Dec.	Birmingham
Smithfield Club	8-12 December	Islington (London)

103 - Horticultural Exposition at St. Petersburg.

Daily Consular and Trade Reports, 15th Year, No. 292, p. 1325. Washington, December 12, 1912.

Under the patronage of the Russian Department of Agriculture an International Horticultural Exhibition will be held at St. Petersburg in April 1913. The exhibition will consist of the following sections: Flower culture; decorative horticulture; hothouse plants and outdoor plants; pomology; fresh and preserved fruits; vegetables; preservation and use of fruit and vegetables; grains; bee-culture; silkworm culture; house plants; scientific section; scholastic section; tools, instruments, and material for horticulture; floral art and a commercial section.

104 - Stock-breeding Exhibitions Subsidised by the Government to be held in Uruguay in 1913-1914.

Fechas para la celebración de las Exposiciones subvencionadas por el Gobierno. — *Revista de la Asociacion Rural del Uruguay*, Year XLI, No. 10, p. 785. Montevideo, October 1912.

The Presidential Decree of September 10, 1912, has fixed the following dates and places for the stock-breeding exhibitions, subsidized by the

Government. Rural Societies have the power to organize non-subsidized fairs and shows.

Places where Exhibitions will be held	Date
Montevideo	Aug. 25, 1913
Salto	First Sunday in Sept. 1913
San Eugenio	2nd ,, ,, ,, ,,
Rivera	3rd ,, ,, ,, ,,
Melo	4th ,, ,, ,, ,,
Paysandu	1st ,, ,, Oct. ,,
San Fructuoso	2nd ,, ,, ,, ,,
Dolores	3rd ,, ,, ,, ,,
San Rosa	4th ,, ,, ,, ,,
Miñas	1st ,, ,, Nov. ,,
Mercedes	2nd ,, ,, ,, ,,
Fray Bentos	3rd ,, ,, ,, ,,
Molles	4th ,, ,, ,, ,,
Lascano	1st ,, ,, Dec. ,,
Treinta y Tres	2nd ,, ,, ,, ,,
Saradi del Yi	3rd ,, ,, ,, ,,
Tranqueras	4th ,, ,, ,, ,,
Carmen	2nd ,, ,, Feb. 1914
Nueva Helvecia	3rd ,, ,, ,, ,,
Maldonado	4th ,, ,, ,, ,,
Florida	1st ,, ,, March ,,
Puntas de Maciel	2nd ,, ,, ,, ,,
San José	3rd ,, ,, ,, ,,
Colonia	4th ,, ,, ,, ,,
Durazno	1st ,, ,, April ,,
Rocha	2nd ,, ,, ,, ,,

105 – Second International Congress of Instruction in Household Management at Ghent, Belgium, in June 1913.

IIe Congrès international de l'Enseignement ménager à Gand, Belgique, en Juin 1913. *Royaume de Belgique. Exposition universelle de Gand* 1913. *Deuxième Congrès international de l'Enseignement ménager. Invitation.*

It has been decided in conjunction with the International Office of Instruction in Household Management at Fribourg, Switzerland, that the second International Congress of Instruction in Household Management shall be held at Ghent in 1913, during the Universal Exhibition, towards the end of June.

Office of Secretary-General: 19, Rue Willems, Bruxelles.

106 – Third International Congress of Farm Women at Ghent, June 12 to 15, 1913.

IIIe Congrès International des Cercles de Fermières à Gand, du 12 au 15 Juin 1913. *Royaume de Belgique. Exposition Universelle de Gand* 1913. *3me Congrès International des Cercles de Fermières. Invitation.*

It is only fifteen years, at the most, since the first farm women's associations were instituted in Canada and the United States. Six years ago, they were established in Belgium and still more recently in Ireland, Poland, Austria, Hungary and France, and the formation of similar societies is announced at an early date in Germany and Spain. The first International Congress of Farm Women was held at Colorado Springs, United States in 1911; the second at Lethbridge, Alberta, Candada; the third will take place at Ghent in 1913 during the Universal Exhibition from June 12 to 15. Secretary's Office: 38 Rue du Pépin, Bruxelles.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

107 – Electric Niagaras in Recent Thunderstorms. (1)

LAFOREST, M. A.: Les Niagaras électriques et les récents orages. — *Journal de la Société Nationale d'Horticulture de France*, 4th Series, Vol. XIII, pp. 572-574. Paris, September 1912.

The electric niagaras which have been in use for eleven years in the department of Vienne are said by the inventors to have afforded complete protection from hailstorms during that period. This statement, contradicted by numerous inhabitants of those regions, was investigated by M. Turpain of Limoges in 1911; he reported that the instruments were of little value, and in the same year a building in Poitiers which bore the apparatus was struck by lightning and set on fire. Notwithstanding this evidence, a powerful instrument was installed at the top of the Eiffel Tower, which was to afford protection to the whole of Paris; yet during this last summer, on five distinct occasions that city experienced heavy hail and thunder storms, giving conclusive proof of the inefficiency of the electric niagaras.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

108 – An Application of the New Pedological Knowledge to Grasslands.

SMITH, W. G. and CRAMPTON, C. B. The Influence of Origin and Topography on Grasslands. — *British Association for the Advancement of Science. Dundee*: 1912. Section M (Agriculture), *m* 13. London.

This is one of the first applications of the new pedological, *i. e.* ecological, knowledge to agriculture in Great Britain.

The extent and distribution of grassland in each district of Britain depends much on the economic requirements, but the natural productive capacity is primarily determined by the nature of the soil and vegetation resulting from the past and present influences of climate and topography, and the distribution of rocks. Extensive tracts of existing grasslands have, under man's operations, replaced other types of vegetation, such as woodland, heath, moor and marsh. Such grassland is liable to change, since it is only a phase introduced into the history of the vegetation. Other areas of grassland are of natural origin, and remain relatively constant under conditions which alter very slowly.

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(1) See No. 622, *B.* April 1912. (*Ed.*).

Grasslands may be grouped into:

1) natural
  a) stable
  b) migratory according to its natural origin
2) artificially induced.

The area of stable grassland in Britain is limited, *e. g.*, chalk downs, and exposed hills and bosses of limestones and basic igneous rocks. The migratory types are widely distributed on alluvial areas and rain-washed slopes along the river and coastal belts, and on the flanks of mountains.

The changes which lead naturally to the evolution of grassland, and other changes leading to its retrogression, are therefore factors to be specially considered where maintenance or improvement of grasslands is in view. It is suggested that these conditions, taken in conjunction with observations on experimental plots, may aid in correlating information on different types of grasslands.

The stable types of grassland apparently owe their existence to the nature of the rocks and to the physiography, which limits the growth of trees and prevents leaching of the surface and stagnancy. Apart from the stable types there are the migratory types mentioned below:

a) Flushing of the slopes of moorland hills with water derived from springs, or with surface water bearing rain-wash, is favourable to the formation of grassland; this is specially well developed where the rocks are rich in lime or other bases, and where the flushing is temporary and periodic.

b) Recent deposits of alluvial clay loams in the higher parts of stream-courses support other types of grassland.

c) Other types are formed on the alluvial clay loams of the flood plains in the lower parts of river courses.

d) Maritime types occur in succession to salt-marsh on coastal flats, and also on steep coastal contours exposed to wind, salt spray and earth-creep, and where the nature of the surface prevents rapid leaching and the formation of heath.

The following conditions lead to the retrogression of grassland:

I. — In moorland districts, invasion by acid, humous, and ferruginous waters leads to deterioration, and in the case of alluvial sandy loams to the formation of pan and consequent stagnation and reversion to moorland.

II. — Continued leaching by rainwater removes the soluble salts from the upper layers of porous sandy loams and leads to production of heath.

III. — Alluvial grasslands and those of moorland flushes deteriorate by leaching when flooding is prevented; the low-lying clay loam alluvial suffers mainly from insufficient drainage.

IV. — Accumulation of humus because of acidity or insufficient grazing discourages the more valuable grasses.

V. — Grasslands may suffer depletion slowly through the continuous removal of wool and carcase.

109 - Rate of Movement of Nitrates in the Soil.

MALPEAUX, L. and LEFORT, G. (Ecole d'Agriculture du Pas-de-Calais). La circulation des nitrates dans le sol. — *Annales de la Science Agronomique*, Year 29, No. 4, pp. 241-258. Paris, October 1912.

Six wooden boxes of 50 cm. cube were filled as follows :— 1) and 2) with sand containing 13.5 % of water, 3), 4), 5) and 6), with a loamy soil containing 16.8 % of water. Both soil and sand were tightly packed down. In 1) and 3) 10 gr. of calcium nitrate were put into a hole, 2.5 cm. in diam. × 3 cm. deep, in the middle of the box. In 2) and 4) 10 grams of sodium nitrate were similarly placed. 5) and 6) received respectively 20 gr. of calcium nitrate and 20 gr. of sodium nitrate sown in a small furrow 2 cm. deep and 40 cm. long running parallel to the near side of the box and about 5 cm. away from it. This side, in the case of 5) and 6), was also perforated by three rows of holes at 5 cm., 10 cm. and 15 cm. from the surface, the holes being 5 cm. apart in the rows. The holes were fitted with corks, and being 2 cm. in diam. allowed an augur of 1.5 cm. diam. to be introduced for sampling. Though the boxes were kept in a place with little ventilation, in order to reduce evaporation, it was found advisable to spray them with 2 litres of water each (equiv. to 0.31 in. of rain) after the experiment had been running 65 days. Samples were taken at 5 cm., 10 cm. and 15 cm. from the deposited nitrate, both in vertical and horizontal directions. The Grandval and Lafoux method was used for the analyses and the results are given in Table I.

Under the above conditions diffusion is evidently extremely slow ; even after four months the distribution of nitrate in the sampling zone is very unequal, the inequality being greater in the soil than in the sand. Vertical diffusion does not appear to be more rapid than lateral.

A second series of experiments was carried out in the field. A good loamy soil was selected and a strip of land marked out into 10 squares each 75 cm. × 75 cm. In the centre of these a hole was made with an iron peg and a charge of sodium nitrate introduced to the required depth by means of a glass tube. The hole was then filled up again with earth.

Plots	1 and 2 were controls.						
,,	3 and 4	received	100 gr.	of nitrate	at a	depth of	1 m.
,,	5 and 6	,,	75	,,	,,	,,	75 cm.
,,	7 and 8	,,	50	,,	,,	,,	50 ,,
,,	9 and 10	,,	25	,,	,,	,,	25 ,,

The surface of even-numbered squares was consolidated as far as possible, while the odd-numbered plots were hoed. Samples were taken from the surface with an augur, 8 cm. deep and at a distance of 5 cm. from the centre ; they yielded the results shown on p. 190.

TABLE I.

Dates of Sampling	Sand						Soil																	
	Ca $(NO_3)_2$			Na NO_3			Ca $(NO_3)_2$									Na NO_3								
	1			2			3			4						5			6					
	Horizontal diffusion			Horizontal diffusion			Horizontal diffusion			Horizontal diffusion			Vertical diffusion			Horizontal diffusion			Horizontal diffusion			Vertical diffusion		
	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.
May 20 (17 days)	* 150	1	1	50	1	1	135	4	5	33	8	5	—	—	—	120	4	4	28	5	4	—	—	—
June 15 (43 days)	350	30	5	385	20	5	362	15	6	50	10	5	25	7	5	400	25	5	60	10	6	20	7	5
July 1 (58 days)	180	50	7	228	28	5	187	26	10	39	11	5	26	5	5	200	35	5	38	8	6	23	5	5
July 11 (68 days)	105	54	8	124	28	8	116	46	7	24	10	8	—	—	—	150	42	6	26	13	5	—	—	—
July 24 (81 days).	85	51	10	110	36	10	106	40	5	19	11	6	38	13	5	123	44	6	22	15	8	29	14	8
August 15 (103 days)	95	44	8	83	54	5	100	44	8	20	17	10	47	11	9	110	40	9	26	18	11	35	15	10
August 29 (117 days)	79	60	9	70	63	7	115	55	9	38	21	12	51	12	10	100	30	10	32	20	13	35	32	13

(*) Nitrates are expressed in milligrams per 100 dry soil.

Plot		Nitrogen in milligrams per 100 dry soil			
		July 13 *	July 24	August 13	August 25
1 hoed	control.	5	7	6	9
2 rolled		5	6	6	9
3 hoed	1 m.	5	7	6	9
4 rolled		5	6	7	10
5 hoed	75 cm.	5	7	10	18
6 rolled		5	10	13	21
7 hoed	50 cm. . . .	5	7	82	102
8 rolled		6	8	90	120
9 hoed	25 cm.	5	18	18	18
10 rolled		5	30	27	25

(*) Experiment begun on this day.
Total rainfall during experiment = 1.47 in.

Though the movement of nitrates by diffusion alone would seem to be a very slow process, the state of things is evidently very different when they are caught up by the capillary current. In 31 days the nitrate deposited at 50 cm. from the surface had reached the sampling zone, or in other words had travelled over 40 cm., while by diffusion alone it would hardly have travelled over 4 cm.

Between August 25 and the end of October, 5.45 in. of rain fell, and on Oct. 25 fresh samples were taken every 10 cm. in depth to examine the distribution of nitrates as affected by the rain. The analyses are given in Table III.

The rain had washed down the nitrates 20 to 30 cm. on the hoed plots owing to their good absorbing surface, and there was a zone of maximum nitrate content for each original depth of nitrate. On the rolled plots there was a second zone of maximum nitrate content nearer to the surface, corresponding to the limit of penetration of the rain. On the whole the nitrates were at a higher level in the soil at the end of the season than at the beginning.

Practical conclusions. — When manuring beets, or other deep rooting plants to which it is usual to apply heavy top dressings of nitrate,

TABLE III.

Nitrates as Nitrogen in milligrams per 100 *dry soil.*

Depth	Controls		1 m.		75 cm.		50 cm.		25 cm.	
	Hoed 1	Rolled 2	Hoed 3	Rolled 4	Hoed 5	Rolled 6	Hoed 7	Rolled 9	Hoed 9	Rolled 10
0-10 cm.	0.7	0.6	0.6	0.5	1.1	1.0	1.3	0.8	0.8	1.1
10-20 »	0.6	0.8	0.7	1.0	1.2	1.6	1.0	0.8	0.9	0.8
20-30 »	0.8	0.8	0.8	2.3	1.3	4.4	0.9	5.6	1.0	6.8
30-40 »	0.8	1.0	1.8	1.5	3.2	7.3	2.4	9.8	5.0	3.2
40-50 »	0.6	0.7	1.1	1.9	7.4	4.6	4.3	9.7	5.1	3.2
50-60 »	0.3	0.2	1.2	1.9	4.3	7.8	3.3	8.1	—	—
60-70 »	0.1	0.1	1.9	2.0	7.2	4.9	2.2	1.6	—	—
70-80 »	0.1	0.2	2.0	1.7	5.2	5.3	—	—	—	—
80-90 »	0.2	0.2	1.3	1.2	—	—	—	—	—	—
90-100 »	0.1	0.1	1.2	1.0	—	—	—	—	—	—

better results would probably be obtained in many cases if the nitrate were buried by an early ploughing or applied very early in the year, as in dry weather the nitrates must often remain quite at the surface and out of reach of the roots. Should they be washed a little too far, they would probably be brought to the root region again in a short time.

110 - New Researches on the Accumulation of Nitrogen in the Soil by Micro-organisms.

DVORAK, J. Studien über die Stickstoffanhäufung im Boden durch Mikroorganismen (Aus der chemisch-phys. Versuchsstation der böhm. Sekt. des Landeskulturrates für das Kgr. Böhmen an der k. k. böhm. Techn. Hochschule in Prag) — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XV, Part 9, pp. 1077-1121 + fig. 1 + diagr. 3. Vienna, September 1912.

The writer considers the fixation of nitrogen in the soil by micro-organisms as one of the most important questions connected with plant production. In three series of researches he investigates some of the principal factors of the phenomenon.

1. *Effect of some vegetable substances upon the assimilation activity of* Azotobacter chroococcum *Beijer.* — It is well known that carbohydrates supply assimilating bacteria with the necessary energy. Experimenting, in nutritive solutions, with some vegetable substances which frequently come into contact with the soil and contain carbo-

hydrates which may be utilized by bacteria, the following results were obtained in comparison with glucose.

Vegetable substance	Carbon percent	Atmospheric Nitrogen assimilated. Mg. per 100 gr. of Carbon
Spruce needles	61.32	57.3
Oak leaves	55.44	89.5
Sycamore leaves	56.89	126.4
Maize leaves	49.03	280.3
Lucerne (green)	48.28	319.5
Wheat straw	51.04	325.4
Stubble	48.33	596.8
Lupins (green)	50.71	711.5
Clover (green)	49.67	1237.9
Glucose	39.97	1456.5

The chief conclusion to be drawn from these data is that the older the vegetable matter, the richer it becomes in ligno-cellulose and consequently less adapted as nutriment for the azotobacter. On the other hand, green stuff, and in a lesser degree roots and straw, contain substances which are easily hydrolised into forms adapted to consumption by bacteria. There are further other micro-organisms in the soil which prepare nutritive material for azotobacter, and there is a whole series of enzymes that render carbohydrates soluble.

2. *Effect of some energy-producing materials on the activity of micro-organisms in the soil.* — Several samples of a beet soil were treated with energy-producing materials, and the activity of the micro-organisms was determined as a function of the intensity of respiration measured by the amount of carbon dioxide given off during 21 days.

Energy-producing materials	Carbon dioxide mg. average per 24 hours	Percent of Carbon transformed into Carbon dioxide
Soil	19.7	—
Soil + 10gr. carbon as glucose	755.4	42.14
„ + „ „ „ levulose	494.9	27.22
„ + „ „ „ starch	526.1	29.00
„ + „ „ „ cellulose	225.2	11.77
„ + „ „ „ oak leaves	328.7	17.70
„ + „ „ „ wheat straw	273.6	14.54
„ + „ „ „ clover (green)	1061.9	59.69

These determinations lead to the practically important result that of all the substances tried, green stuff is the best nutritive medium for the development of bacteria; in it they find, in favourable proportions, carbohydrates and nitrogen; besides, the carbohydrates are in a form which is more easily transformed by the enzymes contained in the bacteria themselves. Consequently green manuring increases the activity of bacteria, it causes a more intense respiration, it raises the temperature of the soil, while the greater development of carbon dioxide favours the porosity of the soil and in union with water facilitates the disintegration of insoluble phosphates and silicates.

3. *Soil biological absorption.* — In the economy of fertilisers in the soil, absorption phenomena play an important part:

a) physical absorption,
b) chemical ,,
c) biological ,,

The first two are fairly well known, not so the third, in virtue of which the substances that constitute the food of plants are retained in an organized form by micro-organisms. The writer defines the biological absorption of nitrogen as the difference between the amount of nitrogen absorbed by a sterilized soil and that absorbed by a non-sterilized one, that is the quantity of nitrogen that is retained by the vegetative and assimilating activity of the micro-organisms in the soil. The following data are characteristic: they were obtained by percolating during 30 days 250 cc. of decinormal solutions of ammonium sulphate, of sodium nitrate and of calcium nitrate through 250 grams of soil:

Nature of the soil	Humus: per cent. dry matter	Nitrogen absorbed: per cent. of nitrogen in			Carbon dioxide given off in six days mg. per 1 kg. of soil
		ammonium sulphate	sodium nitrate	calcium nitrate	
Virgin loam, neutral-acid . . .	3.27	10.23	5.12	4.02	30.6
Field, sandy loam, neutral . . .	2.20	14.10	7.60	6.30	42.5
Field, clayey loam, slightly alkaline.	2.45	17.22	9.21	7.14	45.4
Wood, loam, acid	7.52	8.81	3.98	3.20	28.6
Meadow, sandy loam, acid . . .	2.05	5.62	2.20	1.83	25.2

Practical conclusions:

1. — The biological absorption of ammoniacal nitrogen is much more intense than that of nitric nitrogen.

2. — In biological absorption the behaviour of sodium nitrate is similar to that of calcium nitrate.

3. — There is a connection between biological absorption and the reaction of the soil. The absorption of nitrogen is less active with an acid reaction than with a neutral or alkaline one.

4. — The production of carbon dioxide is an index of the biological absorption of the various soils.

It thus remains demonstrated that biological absorption is an essential factor in the assimilation of inorganic nitrogen in the soil.

111 - The Action of Quicklime on the Soil.

Hutchinson, H. B. In *British Association for the Advancement of Science: Dundee*, 1912. Section M (Agriculture), *m* 5. London.

This paper gives an account of experiments designed to show how far the micro-organisms of the soil are affected by applications of caustic lime.

The addition of small quantities of quicklime to field and garden soils stimulates general bacterial growth, but large quantities cause an initial depression in the numbers of bacteria and the destruction of certain large protozoa, and a cessation of all biological processes. Conversion of the lime from the caustic form into the carbonate, or combination with soil compounds, is followed by a great increase in the numbers of bacteria and increased ammonification of soil compounds. The length of the period during which the bacterial growth is suspended would appear to be determined by the quantity of lime applied, the initial reaction of the soil, and the amount of organic matter present.

Pot experiments have been carried out with variously limed soils, and the crop results show close agreement with those obtained by bacteriological and chemical analyses.

MANURES AND MANURING

112 - The Original Chemical Composition of Peruvian Guano.

El suelo y las plantas. IV. Composición del guano de la islas. — *La Riqueza Agricola*, Vol. I, No. 10, pp. 643-649. + figs. 6. Lima, October 1912.

From the report furnished to the " Compañia Administradore del Guano " (3rd memoir) by the engineer, Sr. J. A. Lavalle Garcia, we are in possession of the following data respecting the original composition of guano and the nature of the deposits of this substance which occur on the islands off the coast of Peru.

The composition of Peruvian guano is very variable, and depends on the following factors:

a) The species of birds which produce it.
b) The geographical situation of the deposits.
c) The period of its formation.
d) The depth of the strata used.
e) The feather content.

Species of birds producing guano. — In spite of the resemblance in the food and in the digestive system of the birds (1) which produce guano, the composition of their excrement is not identical, as might have been supposed; this is shown by the following comparative table:

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(1) Judging from the illustrations, the Alcatráz is a species of Pelican, the Guanay a Cormorant, and the Piquero an Albatross. (*Ed.*).

Chemical composition of the excrement of the chief guano-producing birds, per cent.:

	Alcatraz	Guanay	Piquero
Water	14.57	18.95	5.58
Substances insoluble in acids	0.39	0.47	2.40
Ash	27.46	36.06	72.70
Substances soluble in water	38.86	44.96	15.40
Chlorine	0.54	0.10	0.35
Chlorine reckoned as sodium chloride	0.89	0.17	0.58
Total nitrogen	15.54	11.76	5.46
Organic nitrogen	12.18	8.12	2.02
Ammoniacal nitrogen	3.22	3.50	3.30
Nitric nitrogen	0.14	0.14	0.14
Phosphoric acid	10.15	13.10	5.75
Potash	0.67	1.94	2.07
Lime	9.16	13.16	7.20

These data show the superiority of the guano from " guanais ", which is further confirmed by the nature of its nitrogen content:

	Alcatraz	Guanay
Organic nitrogen	78.38	69.05
Ammoniacal nitrogen	20.72	29.76
Nitric nitrogen	0.90	1.19
Total nitrogen	100.00	100.00

Geographical situation of the deposits. — The richness of guano in nitrogen varies according to climatic conditions and consequently according to the geographical situation of the deposits; thus, the guano of the islands north of Callao is poorer in nitrogen and richer in phosphoric acid than that of the islands lying to the south, on account of the larger rainfall, which occasionally causes a loss of nitrogen. The respective amounts are as follows:

		Nitrogen per cent.	Phosphoric acid per cent.
Lobos Island	N. of Callao	10.80	27.69
Guañape ,,		10.95	28.00
Macabi ,,		10.90	72.60
Chinca ,,	S. of Callao	14.20	24.10

Period of formation. — As time goes on, the guano deposits become poorer, especially in nitrogen, either on account of the rain producing fermentation processes, lixiviation and volatilization, or from the action of the wind, which removes the finest particles.

From experiments made at the Sugar-Cane Experiment Station in Lima, it appears that the losses of nitrogen undergone by guano exposed to the weather are as follows:

	After 10 days	After 30 days
Rich guano	10.44 %	11.94 %
Poor guano	8.00 %	8.00 %

Depth of the layers. — The nearer the layers are to the ground, the more pebbles and sand and the less active organic matter they contain.

Feather content. — The feathers in guano are from their nature rich in nitrogen; their average composition is as follows:

	Per cent.
Nitrogen	14.00
Phosphoric acid	2.64
Ash	7.84

In order to make the guano more homogeneous, the large feathers are removed by means of sieves.

These data respecting the natural conditions of the guano deposits reveal the very variable composition of this fertiliser, and assist in estimating the differences in it; thus the amount of nitrogen, which is the principal element in guano, utilized by the plants can be calculated:

	Per cent. of total nitrogen
Organic nitrogen	55
Ammoniacal „	30
Nitric „	1

The total utilization is thus 86 per cent.; if the losses due to the weather are taken as 10 per cent., and those occasioned by leaching as 5 per cent., the total amount of nitrogen used by the plants would be 70 per cent.

113 – Philippine Guano.

COX, ALVIN, J.: *The Philippine Journal of Science*, Vol. VII, No. 3, pp. 195-199. Manila, 1912.

The phosphatic guanos of the Philippine Islands consist of the excreta of sea fowl and other birds, bats and marine animals, with more or less bone and animal matter furnished by dead bodies, and are found in large quantities in some places, mainly on small islands and in numerous limestone caves. That from caves is usually bat excrement. Deposits of bat guano have been discovered on a great many of the islands, chief among which are Marinduque, Guimaras, Luzon and Mindoro. The deposits in some of the caves consist of one or more thousands of tons.

Probably as yet not over 1000 tons of guano have been mined in the whole Archipelago.

The writer summarizes in a table the results of 55 analyses of Philippine guanos executed by the "Bureau of Science." The following are the maxima and minima:

Moisture	Nitrogen	Nitrogen as Ammonia (NH_3)	Phosphoric Acid (P_2O_5)	Total potash (K_2O)
6.4-68.45	0.10-8.81	0.22-9.93	1.4-23.12	trace-9.10

114 - The Presence of Arsenic in Plants.

AGRICULTU
BOTANY,
CHEMISTR
AND
PHYSIOLO
OF PLANT

JADIN, F. and ASTRUC, A. La présence de l'arsenic dans le règne végétal. — *Journal de Pharmacie et de Chimie*, Year 104, Series 7, Vol. VI, No. 12, pp. 529-535. Paris, December 16, 1912.

It is known, especially owing to the researches of A. Gautier and G. Bertrand, that arsenic is normally present in animals; but until now, little was known of the existence of this substance in plants.

The writers therefore undertook a series of experiments on the normal occurrence of arsenic in the latter. They analysed more than 80 species, adopting the process employed by A. Gautier and modified by G. Bertrand.

The analytic results for each plant are given in a long table from which the following figures, referring to the most common plants, are taken:

	Arsenic in mgr. per 100 gr.	
	Fresh material	Dry material
Orange (pulp)	0.011	0.099
Tangerine orange (pulp)	0.012	0.085
Haricot beans	0.010	0.012
Chickpeas	0.009	0.010
Lentils	0.010	0.012
Dried peas	0.026	0.030
Beans	0.020	0.086
Celery	0.020	0.232
Lettuce	0.023	0.357
Potatoes	0.008	0.031
Chestnuts	0.005	0.011
Hazelnuts	0.011	0.011
Walnuts	0.013	0.013
Bananas (pulp)	0.006	0.033
Dates	0.012	0.017
Asparagus	0.010	0.075
Rice	0.007	0.008
Maize	0.030	0.036
Barley	0.050	0.055
Oats	0.050	0.062
Black truffles	0.020	0.084

From the results obtained, the writers draw the following conclusions:

a) It seems that arsenic is of general occurrence in plants and therefore this element must be of importance for the activity of the protoplasm.

b) Even parasitic plants, not in direct contact with the soil, contain arsenic, which is indispensable for their proper development. Further, there is no relation beteen the amount of arsenic in the parasite and that contained by the host plant.

c) From the arsenic content of any given plant, it is not possible to deduce accurately the amount present in plants belonging to the same botanical group.

d) In any individual plant, the green parts contain more arsenic than those which are not exposed to the light.

e) One of the sources of the arsenic normally prsesent in the organs of animals is the plants which have provided them with food.

115 - Mode of Action of Weak Solutions of Electrolytes on Germination.

MICHEELS, H. Mode d'action des solutions étendues d'électrolytes sur la germination. — *Bulletin de l'Académie Royale de Belgique* (Classe des Sciences), No. 11, pp. 753-765. Bruxelles, 1912.

The writer used wheat grains and the same apparatus as described in his previous papers (1). He started with a $\frac{N}{100}$ solution of potassium chloride, and measured the effect of adding chlorine, potash and hydrochloric acid to electrified and non-electrified solutions. He also used sulphuric acid, electrified solutions of copper sulphate, and finally a $\frac{N.}{1000}$ solution of potassium chloride.

As a result of these experiments, the conclusion is reached that the effect, favourable or otherwise, of electrolytes on germination is due to a disturbed state of equilibrium of the solution — that is to the liberated cations or anions — and not to the acidity or alkalinity produced by the electrolysis. Further, it is suggested that the ill effects of the solutions are caused by a colloidal precipitation within the root cells.

116 - The Chemical Composition of the Oat Kernel. Variety and Variation.

BERRY, R. A. The Oat Kernel. — *British Association for the Advancement of Science; Dundee*, 1912. Section M (Agriculture), *m* 8. London.

This paper gives results obtained from an extensive series of over 700 complete analyses of the oat kernel extending over several years. The oats were grown at the Experiment Station of the West of Scotland

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(1) Action des solutions aqueuses d'électrolytes sur la germination. (*Bull. de l'Acad. roy. de Belgique* (Classe des Sciences), 1909, p. 1076). Action du courant galvanique continu sur la germination (*Ib.*, 1910, p. 51). Action des liquides anodiques et cathodiques sur la germination (*Ib.*, 1910, p. 391).

Agricultural College, on various farms in the West of Scotland, and, in addition, in 1911 at a few centres in the South of England and Wales.

VARIETY. — By tabulating the grain of over a hundred varieties, according to the percentage and weight of kernel, along with the chemical analyses, the writer has distinguished several more or less well-defined types:

The White Grains: 1) small grains with a thin husk, a high percentage of oil, and an average percentage of nitrogen; these are characteristic of and include the old Scotch varieties with the new strains selected from them; 2) large grains fall into two groups, (*a*) a thick husk, a low percentage of oil, and high nitrogen, (*b*) a thin husk, a higher percentage of oil, and a lower nitrogen; 3) grains intermediate in character and chemical composition include the bulk of the newer hybrid varieties.

The Black Grains: 1) small grains with a thick husk, low oil, and average nitrogen; 2) medium grains with a thick husk, high oil, and low nitrogen; 3) large grains with a thin husk and the richest kernel of the cultivated oats.

These are the winter oats. The reddish and yellow grains form separate groups. The wild oat surpasses all in richness of kernel.

VARIATION. — In this respect the results show that climate is the most disturbing factor. Distinguishing characters associated with a certain set of climatic combinations become greatly modified and, in some cases, almost obliterated when the conditions are radically changed. Scotch seed sown in the South of England and Wales in the dry and warm summer of 1911 yielded grain of smaller and drier kernel, a thick husk, higher nitrogen, and lower oil and weight per bushel than grain grown in Scotland. The cooler and more humid climate of the West of Scotland and the longer maturation period produces in the grain the opposite tendencies, except in the poorer and drier localities. The average variation of the grain of over 63 varieties grown annually from 1909 to 1911, under the less extreme climatic conditions prevailing at the Experiment Station, was in comparison small. The unusually warm summer of 1911, however, gave a slightly larger kernel with a thinner husk, slightly poorer in oil and richer in nitrogen than the grain of 1909-10, and would resemble the effect of the normal English summer.

Time of sowing and ordinary dressings of manures produce little effect on the grain. Soils rich in nitrogen produce grain richer in this element.

Foreign and Colonial oats are usually, but not invariably, small, thick husked, relatively rich in oil and nitrogen, and of low weight per bushel; as a rule they have a short maturation period.

OIL AND NITROGEN. — Micro-chemical tests show the oil to be located in the aleurone layer and the embryo. The latter forms from 2.5 to 4 per cent. of the kernel, and contains between 11.25 and 12.25 per cent. of the oil, and between 4.5 and 6.5 per cent. of the protein of the whole kernel. The smaller grains of the same variety are invariably richer in oil but slightly poorer in nitrogen. Analyses made every three days during the formation and maturation of the grain show the oil to increase rapidly in the first half, then remain stationary, whilst nitrogen increases all through the period.

The results seem to show that the variation of the principal constituents of the oat kernel is greater than is usually supposed.

117 - On the Application of Precipitine Reactions to Seed Identification.

ZADE. Die Verwendbarkeit der Präzipitinreaktion in der Samenprüfung. — *Fühlings Landwirtschaftliche Zeitung*, Year 61, No. 23, pp. 807-810. Stuttgart, December 1, 1912.

The present methods of seed examination only determine in a limited manner the quality and source of the seeds: thus it is not possible to distinguish (without previous cultivation experiments) a winter from a summer wheat; nor an awned from an awnless variety. In the same way, the nature of the seeds of leguminous fodder crops is only ascertained and, then not with absolute certainty, from the impurities found among them. Relander (Studien über die Verwendbarkeit der Präzipitinreaktion in der Samenprüfüng, *Abhandlungen der Agrikulturwissenschaftlichen Gesellschaft in Finland*, Heft 1: Helsingfors, 1911) has begun a series of experiments with the object of adopting the precipitine method for seed identification; this method is based upon the knowledge acquired respecting the immunity of animals to infectious diseases and which the writer briefly summarizes.

The blood of infected animals has a specific reaction, *i. e.* it gives a precipitate in the presence of a culture (filtered) of the bacteria which it contains, but none in the presence of a culture of other bacteria. To these reactions the name of precipitines is given. Further, an animal into the blood of which the albuminoids of another species have been introduced, has the power of reacting in conformity with these (albumino-precipitines). Thus, a rabbit which has been inoculated with horse serum gives a precipitate (of albumino-precipitine) in presence of horse serum, but not in the presence of the serum of any other animal. This method, which is a very delicate test, has been adopted for recognizing the blood of different animals, and recently for discovering the differences in the albuminous substances of the lower and higher plants, and thus determining the degree of affinity existing between different plants.

The manner of proceeding is as follows: A sample of wheat, for instance, is reduced to a fine powder, and treated with a given quantity of a physiological solution of sodium chloride. The extract is filtered and injected in small quantities repeated at fixed intervals (3 to 10 days) into the blood of the animal which is the subject of the experiment. Then a small amount of the blood of the animal is taken and freed from corpuscles by centrifugation; the residue, called the immunised serum, is filtered till it becomes completely clear. On adding to the filtrate in a test tube some drops of the wheat extract which was used for the injection, a precipitate is obtained, which is not produced if extracts are introduced which have been prepared from other seeds. The reaction is thus specific and can serve as a diagnostic. The practical value, however, would be very small if this method only served as a way of distinguishing one species from another, since this is effected already by direct examination. Relander's experiments have shown the possibility of obtaining from precipitine reactions a greater amount of differentiation than is furnished by direct seed examination. He found that the serum of a rabbit wich had been injected with an extract of two-rowed barley reacted in the presence of a similar extract (the reaction being more energetic for the same variety than for different ones), while there was no reaction in the case of six-rowed barley.

It should be noticed that there is not always an agreement between botanical affinity and bio-chemical homology, and that certain species can be identified by the bio-chemical method more easily than others. Thus, two-rowed barleys form anti-bodies much more easily than do six-rowed varieties. In only one case was there a similar reaction from two-rowed and six-rowed barleys. This, Relander explains as due to the fact that the two-rowed barley in question was the product of a cross with a six-rowed barley.

The experiments made with red clover showed that the Relander method serves to distinguish Italian and American clover seed from Finnish and Norwegian, but the two latter are indistinguishable from one another.

The writer mentions, in conclusion, that the results hitherto obtained justify the hope that the precipitine method will prove a valuable assistance in seed identification.

118 - On the Inheritance of some Characters in Wheat: I.

SELECTION

HOWARD, A. and HOWARD, G. L. C. (Agricultural Research Institute, Pusa) in *Memoirs of the Department of Agriculture in India (Botanical Series)*, Vol. V, No. 1, pp. 1-46. Calcutta, September 1912.

The results of hybridisation experiments carried out at Pusa during the years 1905-1912 are given. In all cases the work was started from pure lines, and the paper deals chiefly with three series of crosses with Indian wheats:

1. *Felted × Smooth Chaff.* — The felting of the chaff in the wheat examined is shown to be due to at least two kinds of hairs, each of which acts as a single Mendelian factor and is inherited independently of the other.

2. *Red × White Grain and Red × White Chaff.* — Red colour in the grain may be due to the presence of one, two or three independent Mendelian factors, each of which may be isolated and is capable of producing red colouration alone; but the shade thus produced varies. In one case studied, the effect of two red factors combined in one grain was cumulative. Only one factor was found to occur in all the crosses between red and white chaffed wheats.

3. *Bearded × Beardless and Black Awned × White Awned.* — The presence of at least two Mendelian factors in the bearding of wheat is

demonstrated, and in future a sharp distinction will have to be drawn between wheats which are absolutely beardless and those with very short awns or tips. Only one factor was found to occur in the cross between black awned and white awned wheats.

Less extensive investigations were also carried out on:

1) *The consistency of the grain*, by crossing a constant soft wheat with a constant translucent wheat. Consistency in this case appeared to be due to a single Mendelian factor.

2) *The shattering of the ear*, which appeared to be due to two Mendelian factors.

3) *The standing power of the plant*, by a cross between a weak strawed well rooted wheat, and a strong strawed wheat with inferior rooting capacity. All possible combinations were found, and the prospect of obtaining a well rooted, strong strawed wheat in the future seems favourable.

In none of the crosses was there any indication of dominance in the first generation, which in all cases proved intermediate.

CEREAL AND PULSE CROPS

119 - A Summary of Experiments in Barley Growing conducted during the Eleven Years 1901-1911.

HUNTER, H. in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 1. Dublin, October 1912.

The experiments were commenced in 1901 in Cork and Tipperary, but the work was soon extended, and in time included all the barley-growing counties in Ireland. At first the size of the plots was two statute acres each, but after 1908 this was reduced to one acre.

Malting Experiments. — For a number of years the produce of the various plots was malted by Messrs. Guinness, and a sample from each subjected to chemical analysis in their laboratories. The figures in all cases agree with those obtained by previous experimenters, the highest quality barleys being those characterised by a low total nitrogen content. Results will be discussed in detail later when the question of yield and quality is reviewed. With regard to the weight of 1000 corns, assuming equal quality, large grains give better extracts than smaller ones, but in practice it is found that the former do not mature as readily nor to the same degree as the latter, and are in consequence rarely of such good quality.

Variety Experiments. — The varieties tested were:

a) **Narrow-eared — Archer, Scotch Chevallier, Hallett's Chevallier, Old Irish and Danish Archer.**

b) **Wide-eased — Goldthorpe and Standwell.**

A summary of the results is given in the following tables:

I. *Comparison of average values of Archer with other varieties.*

	No. of Tests	No. of years	Yield * brls.	sts.	Av. value p. acre ** in shillings	% difference in favour of Archer
Archer	67	8	11	12	182	8.3
Goldthorpe			10	4	168	
Archer	28	5			166	20.3
Goldthorpe			9	14	154	
Standwell			8	14	138	
Archer	25	3	11	14	179	11.0
Scotch Chevallier. .			10	15	163	
Archer	15	2	12	12	194	12.8
Old Irish			11	9	172	
Archer	11	1	13	5	201	16.9
Hallett's Chevallier.			11	4	172	
Irish Archer . . .	28	4			190 $^{1}/_{2}$	— 0.1
Danish Archer . .					190 $^{3}/_{4}$	

* Yield = quantity of saleable malting barley given in "barrels" = 16 stones = 224 lbs.

** Value per acre = value of total crop, *i. e.* malting corn + screenings.

II. *Comparison of average nitrogen content of Archer and other varieties.*

	No. of tests	No. of years	% nitrogen in grain
Archer	66	8	1.53
Goldthorpe			1.52
Archer	24	4	1.56
Standwell			1.64
Goldthorpe			1.55
Archer	25	3	1.54
Scotch Chevallier .			1.63
Archer	15	2	1.55
Old Irish			1.69
Archer	11	4	1.55
Hallett's Chevallier			1.66

Both for quality and yield, Archer heads the list, and the only objection that can be urged against it is its tendency to late ripening; this can usually be obviated by early sowing. In the broad-eared class Goldthorpe proved superior to Standwell and also to two other varieties of Goldthorpe raised by the Department. The comparison of Archer and Goldthorpe does not show marked superiority for either variety: in every year excepting 1901 the value per acre of Goldthorpe on some of the plots has exceeded that of Archer, but there is not sufficient evidence to warrant the general statement that the former is more suited to certain soils or districts than the latter. Goldthorpe is liable to serious loss by its ears falling off the straw, to which defect Archer is immune;

for this reason its claims to general recommendation clearly outweigh any that can be advanced in favour of Goldthorpe.

Pure Seed Raising Experiments.—These were originally started on account of the difficulty experienced in obtaining pure seed of the different varieties that were being tested. In 1904 it was decided that in future the progeny from *single ears* was to be used, but to bridge over the time which must elapse before a sufficient amount of seed could be produced from this source, "group selection" was practised, *i. e.* a large number of ears from each variety were selected, and the grain used for seed production. In 1906 a selection of Archer was introduced from Denmark, where many single ear cultures have been propagated, and tested against the unselected Irish Archer which had been grown under the Department's supervision since 1904, and which was at least 94 per cent. pure. In 1907 the "group selected" Irish Archer was tested against the Danish Archer, and in 1908 the "single ear" culture of Irish Archer was ready for trial. The following figures indicate the value of the selection-factor on the yield and quality of the barley crop:

		Yield — brls.	sts.	Value per acre in shillings —	Nitrogen content %
1906	Irish Archer	11	12	174	1.52
	Danish "	12	9	185	1.46
1907	Irish Archer	12	2	187	1.55
	Danish "	12	7	192	1.56
1908	Irish Archer	11	2	188	1.44
	Danish "	11	4	187	1.48

The superiority of the Danish Archer, which amounts to 11s. per acre in 1906, is reduced to 5s. per acre in 1907 and to nil in 1908. These experiments suggested a further trial of the extent to which the change of seed from one locality to another is beneficial. Danish Archer was freshly imported from Denmark in the spring of each year, and compared with Irish Archer and Danish Archer grown in Ireland since 1906, with the following results:

Year	Irish Archer		Danish Archer imported 1906		Danish Archer freshly imported each year	
	Value per acre shillings	% N.	Value per acre shillings	% N.	Value per acre shillings	% N.
1906	174	1.52	185	1.46	—	—
1907	187	1.55	191	1.54	192	1.56
1908	188	1.44	184	1.43	187	1.48
1909	220	1.47	222	1.46	224	1.47
1910	159	1.55	161	1.54	159	1.53
1911	187	1.64	188	1.64	—	—

These figures leave no room for any conclusion other than that no difference either in yield or quality exists between Danish Archer seed grown in Ireland for one or more seasons and freshly imported seed.

120 - The Cultivation of Rice in Java.

SIMON, S. V.: Studien über den Reisbau auf Java. — *Der Tropenpflanzer*, Nos. 9-12, pp. 459-484, 527-542, 581-591, 645-660. Berlin, Sept.-Dec. 1912.

This paper is the result of observations made by the writer in Java, and of abstracts of recent publications on the subject, chiefly by the Dutch Government.

Importance of rice culture in Java. — The production of rice in Java is high (5.2 million tons of paddy in 1909), but insufficient for the consumption of the country. The rice is distinguished by its good quality. In the western part of the Island, rice fields occupy the whole of the cultivable area both on the plains and on the mountain slopes, on which they are arranged as terraces and reach up to 3900 feet.

Rice is grown by the natives in small farms; only exceptionally, and by Europeans, on large estates. The Government takes much interest in the progress of the cultivation of this cereal. Experiments bearing on rice growing are conducted at several experiment stations and especially at the one of Tjikömöh to which a school of agriculture for the more educated natives is attached.

Rice is cultivated in Java in two ways, either in "Sawahs" or "Tegalans." The first are terrace-like perfectly level fields, surrounded by embankments and irrigated artificially or watered only by the rainfall. They are broad and regularly shaped in the plains, narrow and irregular in form on the hill slopes; the tegalans are always on inclined and uneven soil; they are not banked round and are watered only by the rain. A sharp distinction between dry and wet rice fields does not exist in Java, because rains fall throughout the year; they are always abundant in the western part of the Island, but less so from May to August (that is during the eastern monsoon) in a part of the east of Java. About 2 per cent. of the "sawahs" occupy swampy lands or those situated on the shores of lakes (Moeras-Sawahs). In 1909 in Java and Madura (not including the principalities of Djokjakarta and Soerakarta) the total area under rice was 6 106 418 acres, of which 3 556 378 ac. were irrigated sawahs, 1 892 530 ac. sawahs depending upon rainfall and 539 940 ac. tegalans. The moeras-sawahs occupied 117 572 acres.

Irrigation works. — The most important irrigation works and canals were constructed and are kept up by the Government or with its assistance. Thus the "wadoeks" or reservoirs of rainwater arranged as terraces on the hill slopes in the residencies of Soerabaya, Rembang and Semarang were improved and are kept in repair by Government aid. The upkeep of the secondary canals devolves on the communes and on the landowners.

The lesser irrigation works and sometimes the preparation of the rice fields are carried out in common by the inhabitants of each village.

The canals are fed by small barrages across the rivers; they branch into lesser canals which convey the water to groups of rice fields, the number of which ranges from 3 to 20, but most frequently from 4 to 6, each of which is situated on a lower level than the preceding ones.

Irrigation experiments. — The irrigation water is almost the only fertilizer used in the rice fields. L. G. den Berger, chemist of the Department, conducted in the Tjikömöh Rice Experiment Station a series of accurate experiments on the distribution of the mineral matter dissolved and held in suspension in the irrigation water, on the quantities of it that were deposited and on their effect upon the crops.

As a result of this experiment he came to the conclusion that for a good distribution of the water and of the fertilizers it contains, it would be advantageous to alternate the fields that are the first to receive the water from the irrigation canals.

The excessive deposition of silt in the fields that first receive the water must be avoided, especially if it is calcareous, because it would diminish the permeability of the soil, or if too rich in organic substances, as this would favour vegetative growth too much at the expense of the yield.

Soils. — For the most part they are very clayey, deep, and of fine and regular texture; they are poor in humus (rice fields rich in humus have frequently an acid reaction, which does not suit rice) and in lime; they are also frequently relatively deficient in phosphoric acid. Especially in the western part of the island laterite soils prevail. The black alluvial soils of volcanic origin in the Passoeroean residency, especially rich in apatite, are the best of Java and give very heavy crops. In central Java there are recent volcanic soils containing much potash and deficient only in nitrogen; when they are manured with sulphate of ammonia they give excellent crops.

Varieties and selection. — The earliest varieties mature within four months from sowing, the latest in six or seven months. Besides *Oryza sativa, O. glutinosa* is also cultivated; both of them possess many varieties, some being more suitable for growing in sawahs, others in tegalans, some are bearded, others beardless, some early, some late. The Rice Experiment Station has isolated and cultivated experimentally 800 good native varieties, the selection of which has been begun on the Svalöf lines.

Rotation. — After the first rice crop (October to March), that is during the west monsoon, if the rice field is irrigable the soil is left fallow for about a month, during which time the harvested paddy is dried and stored; then the field is again flooded and the cultivation of rice is repeated.

Rice may be grown on the same field for several years in succession, as is often done in the moist parts of western Java. At most, two crops a year can be obtained, but those varieties which require 7 to 9 months from sowing to harvesting and yield three crops in two years are preferred, as they give a better product.

In West Java, especially in the Preang regency, the cultivation of rice alternates from time to time with the rearing of gold fish. Two months are sufficient for the fish to attain a marketable size.

If during the east monsoon there is not enough water available, one part of the fields is put under rapidly growing dry crops such as earth nuts, Bambarra groundnuts, soy beans, cowpeas, moon beans, several kinds of capsicums (lombok), sweet potatoes, yams ; and in the very dry districts, especially of eastern Java, a good deal of maize is grown, as well as sorghum, millet, coix, etc. and, among the plants intended for sale, tobacco. Sometimes, after rice, the soil is left fallow foı a few months and utilized as pasture for buffaloes and other cattle.

The crops which follow rice in the rotation, are arranged in the following decreasing order of merit according to their property of oxidizing the soil and of preserving its fertility : Leguminosæ ; other dry crops ; fallow with grazing ; fish rearing. Flooding the soil without any cultivation is absolutely to be condemned, also because it favours the spread of weeds, especially *Pontederina crassipes*. *Special rotations* are found where the cultivation of the sugar cane or of tobacco is much practised(1). After sugar canes, if there is sufficient water, the rice fields are immediately prepared ; in the contrary case, which is frequent, Leguminosæ are grown for two or three months. Anyhow, by March or April the paddy must be harvested to make room for the preparation of the soil for sugar canes, which are planted from April to July.

Cultivation in the sawahs. — The work of preparing the ground lasts about 50 days. Care is taken not to make the seed beds in too fertile soils. The rice is sown 30 to 40 days before transplanting. Formerly only whole ears were sown; now the sowing of the separated grains is preferred. The seeds that float on the water are discarded; the rest are steeped in water for two or three days, being kept in baskests in running water.

One pound of soaked rice is enough for about 8 sq. yds. of seed bed ; and 390 sq. yds. of seed bed are sufficient for one acre. The seedbeds are moderately irrigated or not at all. In the first case the seedlings can be planted out 30 to 40 days after sowing; in the second sometimes as many as 100 days are necessary. The use of dry seed beds is continually spreading. Before removing the seedlings from the seedbeds these are well irrigated if they are dry beds ; if, on the contrary, they are flooded beds the water is turned off. In western Java the seedlings about 12 to 16 inches high are tied into small bundles and a half or one third of their haulms are cut away. The seedlings are set mostly in rows in the dry or almost dry fields. In the Preang regency two to four seedlings are planted in each hole ; a group of two or three plants gives on average 15 to 20 haulms. The distance at which the seedlings are placed from each other varies considerably. In the plains, varieties having a long period of vegetation and consequently freely tillering, are placed at intervals of 8 to 10 inches, while short-lived varieties that do not tiller much are planted at 5 to 6 inches apart; in the mountains, in poorer soils, the intervals are still less.

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(1) See MIEHE, H. Der Tabakbau in den Vorstenlanden auf Java. — *Der Tropenpflanzer*, 1911, Year 15, No. 9. pp. 468-479. Berlin, 1911. See also No. 134 below. (*Ed.*).

In the first days after transplanting the rice is moderately irrigated; after 15 to 20 days it is flooded. Shortly afterwards the first weeding is undertaken. Then for two or two and a half months about 4 inches of water are kept on the land. In the second half of this period the second and last weeding is carried out, the water being turned off two days previously and admitted again two days after. When the ear begins to form the depth of the water is diminished, and when the ears begin to turn yellow the water is completely turned off.

Cultivation in the tegalans. — The rice is mostly cultivated together with other crops, bananas or herbaceous plants. In this case as many as three crops a year are harvested, for instance: maize, rice and sesamum. Tegalans are frequently used to begin the cultivation of land which up till then had been under bush. This is cut, allowed to dry and then burnt, the ground is broken up and sometimes divided into rough terraces to prevent too much earth being carried away by the rains. After the rains of the western monsoon, the rice is sown in holes. The second rice crop is about $^2/_3$ of the first, and the third does not always cover expenses. The poorest soils, after several harvests, are left to themselves for some years, during which they get covered with bush; the ground is then broken up again. In 1909 there were 2 712 500 acres of regularly cultivated tegalans, of which only 525 000 ac. under rice. The burning of forests followed by the growing of mountain rice (as it is still practised in Siam and in the Sonda Islands) is unknown in Java.

Harvest. — The rice is reaped very high, in two or three times, removing the ears singly by means of a special knife with a curved blade. The reapers are paid in kind, from $^1/_{25}$ to $^1/_5$ of the quantity reaped, most frequently $^1/_{12}$ or $^1/_{11}$; those who, besides reaping, have assisted in the preparation of the soil or in transplanting the seedlings, get from $^1/_5$ to ¼.

Successive operations. — When the rice sheaves are dry they are put in huts with interwoven bamboo sides and roof of alang-alang (*Imperata arundinacea*). After 40 days husking begins. For this purpose wooden mortars are used, and only the quantity consumed in the course of the day is husked at a time. In Java there are also mills for the mechanical husking of rice; most of them belong to Chinese. They are driven by water power and are of a somewhat primitive character. The rice they turn out has a good many broken grains and is not suited for exportation, the supply for which comes from the European mills of Batavia and neighbourhood.

Yield. — The average yield of irrigated rice fields is about 7120 lbs. per acre; of rice fields depending only on rainfall 4750 lbs. per acre, and from tegalans about 3560 lbs. per acre.

Diseases and pests. — " Omo poetih," which means white disease, is a kind of etiolation which attacks the seedlings in the seed beds and mostly disappears on transplanting ; it is caused by insufficiency of plant food or by mouldiness of the seed beds ; it is frequent but not very injurious. " Omo bang " or " mentek " appears only 40 or 50 days after planting out; it is caused by *Tylenchus oryzae*, which attacks the roots. This disease is at present limited to the central parts of the island, and has sometimes caused very considerable losses. The only remedy hitherto known is to alternate rice with dry crops.

The larvæ of *Schoenobius punctellus* devour portions of the internodes of the haulm, which in consequence produces ears with no grains in them.

Leptocorisa acuta sucks the juice from the ripening grain and sometimes does much mischief.

In April and May at times a nocturnal insect, called by the natives "walang-sangit" appears in great swarms which would destroy whole crops if they were not controlled by the lighting of fires in which they burn their wings.

Among vertebrates, voles are the most injurious. Their numbers are kept down by protecting the great rice field snakes (*Python bivittatus* and *P. reticulatus*).

Among birds the most harmful are *Amadina oryzivora*, several species of *Munia*, etc. (1).

121 - The Cultivation of Rice with the Help of Machines.

MAIN, F.: La culture mécanique du riz en Indochine.(2). — *Journal d'Agriculture tropicale*, 12th Year, No. 137, pp. 321-325. Paris, November 30, 1912.

The writer, in analysing the monthly reports of the Indo-Chinese Rice-growing Association, points out the importance of the results obtained in 1912 by M. Alazard, agricultural engineer, attached to the Association, who after having shown the necessity of improving the plant used in the mechanical tillage of the soil, claims to have solved the problem of weeding by cutting the reeds under water by means of a mower. By sowing directly in the rice field, vigorous and fertile plants are obtained.

It has likewise been proved that machines can be used for ploughing normal rice fields, that is those exposed to flooding during several months, and that transplanting is not indispensable in order to obtain a crop. These two points are of capital importance, as well as the fact that reeds are not an unsurmountable obstacle to the cultivation of rice and that the rice grower possesses suitable machines for their destruction. The use of this means is connected with the observation of certain physiological conditions of the existence of plants : when plants are mown under water the crown and the roots are asphyxiated and die rapidly; thus the reeds that are mown do not send out new shoots. These results, especially considering the conditions under which they have been obtained, are sufficient to encourage further efforts in the cultivation of rice with the help of machines.

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(1) See No. 27, *B*. Jan. 1913. (Ed.).
(2) See No. 1612, *B*. Dec. 1912. (Ed.).

122 - Cambodia Soy Beans.

Soya de Cambodge. — *L'Agriculture pratique des pays chauds*, 13th Year, No. 116, p. 410. Paris, November 1912.

The Colonial Garden has lately had occasion to examine a sample of soy beans from Cambodia. This sample was analysed in the laboratory of the Chemical Service and found to contain:

Water	7	per cent.
Proteins	41.6	,,
Fat	18.6	,,

The fat content of this soy is rather high, the average being only 17 to 18 per cent.

This soy, submitted to expert brokers, was judged to be of good quality and of easy sale. Cambodia seems capable of producing large quantities of this pulse. According to information received it is cultivated in Cambodia only for local consumption.

FORAGE CROPS: MEADOWS AND PASTURES

123 - Experiments in Growing Lucerne of Various Origins in Denmark.

HANSEN, P. Dyrkningsforsög med Lucerne fra forskellige Avlssteder. — 63 Beretning fra Statens Forsögsvirksomhed i Plantekultur. — *Tidskrift for Landbrugets Planteavl* Vol. 19, Part 3, pp. 377-411. Copenhagen, 1912.

Comparative experiments in growing lucerne of various origins were carried out between 1901 and 1907 on the experimental fields of the Danish Service for Plant Selection. These experiments were a continuation of a preceding series extending over the period from 1884 to 1899, and dealt with 40 samples from Hungary, 19 from Germany, 21 from France, 13 from Italy, 17 from Russia, 2 from Spain, 12 from America and 4 from Turkestan, altogether 128 samples grown in 610 plots.

From the results as a whole the following general conclusions may be drawn, taking into due account the conditions of Denmark.

Hungarian lucerne may be considered from the Danish point of view as the best and the safest. All the samples proved good, and with but slight differences. Its chief merits are its permanence and resistance to cold. The first cut gives the major portion of the yearly crop, the successive cuts yielding very little; in the year in which it is sown and in the succeeding one Hungarian lucerne is somewhat less productive than the other varieties.

German lucerne is mostly a hybrid of *Medicago sativa and M. falcata*; it is very luxuriant in the year in which it is sown and in the succeeding year, but afterwards it becomes less productive, possessing a low permanence. Compared with Hungarian lucerne, German lucerne does not yield as much at the first cut, but the successive cuts are somewhat more abundant.

French lucerne, according to the samples tested, was uneven, some being good, but most inferior to Hungarian lucerne. The first year's crop of French lucerne was more abundant than that of the Hungarian lucerne, but its permanence was inferior.

Italian lucerne behaves like French lucerne, only its permanence is inferior.

Russian lucerne: the few samples tested gave good results for the first year's crop, but the yield diminished from year to year.

The samples of American, Spanish, and Turkestan lucerne gave scanty results, showing themselves unsuitable to conditions obtaining in Denmark.

Taking as basis the following general averages for Hungarian lucerne:

Yearly yield in cwts. per "Tondeland" = 1.362 acres.

I Year	II Year	III Year
64.65	89.54	154.40

and expressing the yield of the other varieties tested as percentages of the above, the following comparative figures are obtained:

Origin —	Crop I year	 II year	 III year
Hungarian	100	100	100
German	102	92	89
French	102	96	97
Italian	104	96	90
Russian	94	83	69
American	45	49	67

These figures represent the suitability of the various lucernes to the cultural conditions of Denmark.

124 - The Exportation and Importation of Clover and Lucerne Seed into Hungary in 1910-11 and 1911-12.

FOLDVARY. Külkereskedelmi heremagforgalmunk kétévi eredményének összehasonlítása. — *Mezőgazdák*, Year IX, No. 22, p. 184. Budapest, November 30, 1912.

The production of clover and lucerne seed in Hungary differs according to the climatic conditions, and while almost none in abnormally dry or damp years, the crop is lucrative when the season commences with an abundant rainfall and concludes with a prolonged period of heat. When the damp continues, the clover succeeds the better, while if the heat predominates, the lucerne is the more satisfactory crop.

After reserving seed for home use, the rest of the produce is exported, indeed sometimes even some of that needed for sowing, the deficiency being made up by imported seed; this trade depends on many factors, commercial, agricultural and especially climatic. This is shown by the following table for the commercial years of 1910-11 and 1911-12.

Clover Seed.

	Exports		Imports	
	tons	£	tons	£
Wet summer 1910 (Commercial year 1910-1911)	4 741	270 848	1 196	75 919
Dry summer 1911 (Commercial year 1911-1912)	2 320	138 298	2 026	138 285

Lucerne Seed.

	Exports		Imports	
	tons	£	tons	£
Wet summer 1910 (Commercial year 1910-1911)	648	43 889	332	25 295
Dry summer 1911 (Commercial year 1911-1912)	1 095	71 342	279	21 864

It is seen that the revenue derived from the export of clover seed (the imports having been deducted) during the wet year was £199 953, while in the dry year it was only £13. But on the other hand, the lucerne in the wet year fetched only £18 594, as against £49 478 in the dry year. The result is that the clover years are the most favourable for Hungary; in the present case the net total revenue from clover seed in 1910 was £212 689, as against £49 491 only from lucerne in 1911.

The statistics show that the export trade is greatest in autumn and the import before sowing. The Hungarian seed is sold after the harvest at from £4 9s. to £7 3s. per cwt., and before the time of sowing, foreign seed is bought at from £7 to £8 12*s.*, the higher price the latter fetches being due to its greater purity.

FIBRE CROPS

125 - Cotton Growing in Lousiana.

Spahr (Hohensholm, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana. B. Der Baumwollbau (1). — *Der Tropenpflanzer*, 16th Year, No. 11, pp. 591-607 + fig Berlin, November 1911.

Cotton growing began in Louisiana towards the end of the seventeenth century; Siamese white lint cotton was introduced in 1758.

Climatic Conditions. — Louisiana is now one of the principal cotton growing countries of the world, and this chiefly owing to its climate: relatively high temperature (from April to November: the lowest mean monthly temperature in November in Northern Louisiana being 7.7°C., the highest, also in Northern Louisiana, in July, 34.3° C.); long period of vegetation; a good deal of sunlight (from June to September: completely cloudy days 19.4 in North Louisiana and 21 in S. Louisiana); regular and well distributed rains during the growing period (on average 4 $^3/_4$ inches per month from June to September) and dry weather during the ripening period.

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(1) For the article on sugarcane see No. 128 below. (*Ed*).

Soil. — Cotton can be raised on all kinds of soil, though with varying success. On sandy soils the plants develop less; on heavy soils they attain, especially in wet years, considerable height, but in proportion to their size do not yield much lint. The same in low lying lands: in favourable years the crops are good but in others they are much damaged by animal and vegetable pests. The most favourable of all are medium loams. However, with the aid of manuring and suitable tillage even the less favourable soils can be made to yield satisfactory crops.

Cultivation. — As there is still a good deal of uncultivated land, cotton growing might have considerably extended if it had not been checked by the appearance of the boll weevil (*Anthonomus grandis* Boh.), which has not only set a limit to further extension but has obliged many planters to give up cotton altogether.

Rotations. — Those most commonly adopted are the following:

a) 1st year cotton, 2nd year maize then cow peas.

b) 1st and 2nd years cotton, 3rd year maize and 4th year cow peas;

c) 1st year cotton, 2nd maize and cowpeas, 3rd winter oats (sown at the end of October or beginning of November) then cowpeas (sown on the stubble in May).

d) as the preceeding, but with cotton for two years or in the 3rd year sowing in the oats Japanese clover (*Lespedeza striata*) which occupies the 4th year also. On loams sometimes *Vicia villosa* or clover is sown in the oats; on sandy soils crimson clover is sown in the oats and Velvet beans in the maize or, these by themselves, or peanuts, especially the Spanish variety.

Preparation of the Soil. — Is not always carried out with due care. Sometimes it consists in merely ploughing up the ridges of the previous year before sowing. The best results are obtained by those farmers who begin their ploughing towards the end of autumn or beginning of winter. Among other advantages there is that of destroying many pupae of boll worms (*Heliothis armiger*). In the large estates the subsoil plough is also used; by this means alone the crop of seed cotton increases by about 150 lb. per acre. After ploughing, which is done crosswise to the direction in which the cotton will be planted, the ground is repeatedly harrowed, and rolled until a garden-like tilth is attained. In low lying ground the rows are ploughed, so that the soil may dry better if the weather is unfavourable. On high land this is done only just before sowing or is omitted altogether.

Manuring. — It is often defective. Experiments carried out for many years in succession at the Baton Rouge and Calhoun Experiment Stations have proved the necessity of completing organic manures by chemicals. The best results were obtained with 30 bushels per acre of a compost consisting of 100 bushels of cotton seed, 100 bushels of farmyard manure, and 2000 lbs. of phosphate. At Calhoun, land manured with this compost yielded an average of 1513 lbs. of seed cotton per acre, and at Baton Rouge 1246.6 lbs., whilst the unmanured plots yielded only

466 lbs. and 1034.3 lbs. respectively. The quantity of artificials given to cotton in Louisiana is trifling.

Varieties. — Early varieties are grown, especially short stapled, small bolled, Upland varieties. Long stapled early varieties (Sea Island) have been bred and the United States Department of Agriculture is endeavouring to introduce them, but their cultivation and harvesting are more difficult, and for ginning them special gins are required; further they do not sell well on the local markets and they require continuous selection; for these reasons few planters care to grow them. The most widely spread varieties are the following:

1) Tooles Early Prolific. Short staple and small bolls. About 87 bolls give 1 lb. of seed cotton. It is a low early bush, and it produces much seed cotton and lint.

2) King's Early Improved. Short stapled, abundant, seeds small, long branches.

3) Simpkin's Early Prolific. Short stapled, somewhat earlier and more productive than the preceding, long branches, short internodes, seeds small.

4) Mebane's Early Triumph. Short stapled, large bolls. Seeds medium sized. 46 bolls yield 1 lb. of seed cotton.

Many farmers in the north of the cotton belt use imported seed. This ripens earlier than the native seed but every two years new seed has to be imported.

In most cases the seed is taken from the ginning works. Many farmers get their seed from merchants or direct from the growers, especially in Georgia, S. Carolina and Alabama. Only a few of the largest farmers produce their own good seed by means of selection.

Interculture. — The seeds are sown in rows as early as possible when no more frosts are to be expected (March-April). The quantity of seed is 1 bushel (30 lb.) per acre, though as experiments conducted in Texas by the Bureau of Plant Industry have shown, 4 to 7½ lbs. of seed per acre are sufficient under favourable conditions to give a good stand.

The distance between the rows ranges from 3 to 5 feet and between the plants from 10 to 30 inches according to the soil and the variety of cotton grown. According to the writer the advice to plant at a great distance apart is not sound beyond a certain limit, because formerly the cotton plants continued producing buds till September and even October, whilst now the plants produce only up to the middle of August, because after this date the boll weevil prevents any further bud formation. Experiments carried out by the State Crop Pest Commission in the years 1907 and 1908 showed that close planting gave the best results, increasing the crop by 30 to 60 per cent. The most favourable distances were found to be:

	Between the rows	Between the plants
1. On poor high land	3 feet	10 inches
2. On rich high land and good prairie soil	3 ,,	12 ,,
3. On poor or very sandy plain land	3½ ,,	12 ,,
4. On well drained plains of medium fertility . .	4 ,,	15 ,,

These experiments showed also that in close planting the ants (*Solenopsis geminata*) played more havoc among the boll-weevil brood than heat or parasites.

A few days after sowing, the tilling of the soil begins again in order to keep the surface loosened. At first the harrow is used and then the cultivator. Singling is performed twice, once when the plants are about one inch high and the second time when they are 12 inches high; after this they are slightly earthed up, and, weather permitting, the ground is worked once a week with the cultivator. At the end of July or beginning of August the soil is smoothed and thoroughly harrowed.

Topping has been given up.

Harvest. — The harvest begins usually at the end of August and lasts to the middle of December. The quantity picked by one labourer in a day varies considerably. Some barely reach 100 lbs., others pick 300 to 350 lbs., first class pickers attaining 500 and 600 lbs. The cost of picking is about 75 cents (3*s.* 1*d.*) per 100 lbs.

The cotton is not dried before being ginned. Ginning is done in special mills which deal with at least 50 to 75 bales a day and in some instances as many as 250 per day. The cost of ginning a bale is $2.50 (10 *s.* 3 *d.*). As payment seeds are accepted. In 1906 there were upwards of 1500 ginning mills against 1200 in 1911. The seeds that are not used for sowing are sent to the oil mills, of which there are about 50 in the State.

Yield. — The average yield has increased somewhat of late years, but it is only about 170 lbs. of lint per acre (in 1911 it reached only 143 lbs. per acre). With intensive farming and energetic control of the boll weevil it is possible to attain much higher yields, as is proved by statistics which show that as much as 356 lbs. per acre have been obtained.

Control of parasites. — The boll weevil appeared for the first time in 1830 at Monclova in Mexico, where in 5 five years it played such havoc that cotton growing had to be given up; in 1850 it reached Matamoras and 10 years later the Rio Grande. In 1862 it appeared at Brownsville, Texas, and in 1903 in Louisiana. By the end of 1908 it infested the whole cotton territory of the State. The harm that it has done may be seen from the following figures (next page).

For the direct control of the boll weevil, arsenate of lead sprays have been suggested, but owing to the difficulties attendant upon its use this remedy has not become popular. On the other hand the practice of collecting the infected bolls from the beginning of May to the end of July has become general. The bolls are placed in boxes covered with wire netting, the meshes of which are wide enough to allow the parasites of the weevils to escape but not the weevils. It would be of very great advantage

Year	Under cotton acres	Lint 500 lb. bales
1902	1 617 586	882 073
1909	930 000	253 412
1911	1 075 000	365 500

to destroy the cotton plants early in autumn, but few growers make up their minds to do so. The utility of this measure, besides being proved by the experiments of the State Crop Pest Commission, has been shown by the immunity from the pest enjoyed by the plantations grown in localities in which the cotton plants had been destroyed by frost in the preceding year, as was the case in the northern parishes of Louisiana after the frost of 1907.

For destroying the plants at the end of the season some machines have been invented, one of the simplest of which consists of a cylinder of 18 inches diameter and 6 feet in length bearing sharp iron bars 3 inches broad and 1½ inch thick. With this machine 10 to 12 acres a day can be cut.

Before the appearance of the boll weevil those varieties the bolls of which ripened before the danger of frost was to be apprehended were considered early. Now early varieties are those that show first the setting of fruit buds. The signs of precocity are: low branches (the main branches that do not bear fruit must not be more than four); short internodes; fruit branches at every internode of the main stem or of the main branches; continuous growth of the fruit branches, as the boll weevil attacks first the upper twigs and does not damage the bolls so long as there are available buds; the average breadth of the leaves for the plants of the high lying lands must not be more than 6 inches and for the plains not more than 4 or 5 inches.

In selecting, the following points are also to be observed:

1) Size of the bolls (the larger bolls being easier to pick and offering greater resistance to bad weather).
2) High percentage of lint (38 to 40 per cent.).
3) Length of staple not under one inch.
4) Resistance to bad weather.

126 – Cambodia Cotton in Bombay Presidency.

MAIN, T. F. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 373-381. Calcutta-London, 1912.

The seed of Cambodia cotton was introduced into the Madras Presidency from Pondicherry through two independent channels in 1904 and in 1905 (1). In the Bombay Presidency it was introduced from the Philippine Islands in 1905, and from Tonking in 1906. Later on seed was obtained from the Madras Presidency as well as from various other sources.

Experimental trials were commenced in Gujerat, but the local conditions (a heavy black cotton soil and a rainfall of 36.33 inches) did not appear to suit this cotton, which was then transferred to Dharwar in the south of the Presidency, where it yielded promising results for a year or two and then appeared to deteriorate as regards prolificness and resistance to "red leaf blight" which attacks all exotic cottons at Dharwar. On the contrary, good results were obtained in the south-east of the Dharwar District, where Dharwar American cotton, introduced nearly a century ago, had acclimatized itself, and is cultivated as a non-irrigated crop, being grown in the *rabi* season on the medium black soils and sown at the beginning of the monsoon on the red soils. Accordingly an experimental farm was established at Gadag in 1908-9, with the primary object of testing the suitability of newly introduced American and Cambodia cottons and for comparing these with the Dharwar American.

The results obtained — without irrigation — both on the farm and in cultivators' fields, prove this cotton to be well adapted for cultivation at Gadag. The following table shows the results of comparative experiments with local saw-ginned Dharwar American.

Season	Yield per acre of seed cotton in lbs.		Ginning percentage		Remarks
	Cambodia	Saw-Ginned Dharwar American	Cambodia	Saw-ginned Dharwar American	
1909–1910. .	430	384	42.80	30.87	
1910-1911. .	410.5	221	38.30	30.70	A moderate season.
1911–1912. .	197	101	38.05	28.30	A very bad season.

The season 1911-12 was characterized by exceptional drought. The total rainfall for the season amounted to only 13.77 inches, of which only 0.80 in. fell after the crop was sown, against an average of 23.43 inches. Nevertheless the above results afford the proof that Cambodia cotton is a drought-resisting variety of exceptional capacity.

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(1) Cambodia cotton has spread rapidly in the Madras Presidency, where it succeeds only with irrigation. It is distinguished for its vigour, high yield and good quality of lint. On well manured land under irrigation the yield is usually stated to be from 1250 to 1600 lbs. of kappas and never less; while yields as high as 2500 lbs. have been reported. It has a ginning percentage of 33 to 35 per cent. of lint. H. SAMPSON., The introduction and spread of Cambodia cotton in the Madras Presidency. — *The Agricultural Journal of India*, Vol. VI, Part IV, pp. 365-368. Calcutta-London, Oct. 1911. (*Ed.*).

Cambodia cotton has further the following advantages over the local saw-ginned Dharwar American: A higher ginning percentage; the seed cotton, being produced in large well-opening bolls, can be picked cleaner; the cotton is "bulkier," its colour is brighter and the staple more uniform, and lastly it is markedly resistant to "red leaf blight." (1) At a sale by auction held in 1912, Cambodia cotton fetched 43 per cent. more than the local variety. The spinning tests also yielded satisfactory results.

Among the sub-varieties of Cambodia, 102 E proved to be the best, and the economic results that may reasonably be expected from it are given as follows:

	Cambodia 102 E	Saw-ginned Dharwar American
Cost of production per acre	18*s*. 8*d*.	18*s*. 8*d*.
Yield: seed cotton, per acre	310 lbs.	275 lbs.
Price of 1 lb. unginned cotton	1.85*d*.	1.42*d*.
Value of produce per acre	47*s*. 9*d*.	32*s*. 9*d*.
Net profit per acre	29*s*. 1*d*.	14*s*. 1*d*.

It would therefore increase very considerably the wealth of the district if the 200 000 acres annually devoted to saw-ginned Dharwar American were sown with Cambodia 102 E.

The writer concludes by demonstrating the necessity of continuing the selection of the Cambodia seed, so as to prevent any falling off in its qualities, of multiplying the selected seed on a large scale, and lastly of preventing cultivators allowing this cotton to become mixed with the local variety.

127 — The Improvement of Cotton in India.

The Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 351-372. London, 1912.

During recent years the Provincial Agricultural Departments in India have carried out experiments with a view to the improvement of indigenous varieties and the trial of exotic cottons.

Many samples of cotton produced in the course of these experiments were sent to the Imperial Institute, and the present article gives an account of the examination and commercial valuation of specimens from Madras, Central Provinces, United Provinces, Eastern Bengal, Assam and Burma (2).

Madras cotton. — One of the chief native forms of cotton cultivated in Madras is known as "Tinnevelly." This really consists of a mixture of two varieties, "Uppam" a small bolled variety of *Gossypium her-*

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(1) "Red leaf blight" (Physiological Disease). This reddening, resembling autumnal coloration, occurs most frequently toward the season's end and is most common upon poor soil. It is chiefly due to lack of nourishment. Attacks of the mite cause a similar appearance. STEVENS and HALL, *Diseases of Economic Plants*, pp. 405-406. New York, 1910.

(2) See No. 102, *B*. Jan. 1912. (*Ed.*).

baceum, and " Karunganni " a form of *G. indicum*. " Uppam " is grown on black cotton soils in Coimbatore and Madura practically as a single variety. It is also grown mixed, usually with " Karunganni " and " Nadam " (a form of *G. obtusifolium*) in the east of Salem, south of South Arcot and north of Trichinopoly. It is also grown throughout the black soil areas of Tinnevelly as a single crop or as mixtures containing as little as 5 per cent., the remainder being " Karunganni ". The latter is to some extent grown also on red, mixed and shallow soils ; it is a finer, stronger and more even stapled cotton than " Uppam " and the Agricultural Department is endeavouring to extend its cultivation in Tinnevelly.

Among the exotic cottons which have been introduced, "Cambodia" (1) has proved the most successful, and it is said that on irrigated land it gives four or five times the yield of the dry land indigenous cottons, whilst the quality of the lint is satisfactory. In Tinnevelly and Ramnad, wells are being sunk on a large scale with the primary object of growing this cotton. The last crop was estimated at 33 000 bales of 400 lb., valued at £400 000.

The comparative examination of the Madras cottons carried out at the Imperial Institute has shown that " Karunganni " approximates in fineness to Egyptian cotton (length from 0.8 to 1.1 in. and the average diameter 0.00074 in.) while " Uppam " has the ordinary coarse character of most Indian cottons (length from 0.9 to 1.1 in. and average diameter 0.00084). In other respects the " Karunganni " cotton is little if at all superior to " Uppam ". It yielded on ginning 28.1 per cent. of lint as against 29.5 ; the weights of lint per 100 seeds were respectively 1.90 grams and 2.15. " Cambodia " is of very satisfactory quality (yield on ginning 37.9 per cent. of lint or 6.89 grams per 100 seeds ; length from 0.9 to 1.2 in.) and resembled samples of the same variety of cotton grown in Burma.

The Georgia Upland Cotton is of good quality (yield on ginning 37.1 per cent. of lint or 5.27 grams per 100 seeds, and length from 0.9 to 1.2 inches) but inferior to the acclimatised Cambodia cotton.

Samples of cotton from the Central Provinces. — The chief work of the Agricultural Deaprtment in the Central Provinces on cotton has been the selection of improved forms from the native races of cotton.

The cotton known as Berar " jari " consists of a mixture of a number of distinct races. Six of these have been isolated, and five of them, viz. *Gossypium neglectum* var. *vera*, *G. neglectum* var. *vera* sub-var. *malvensis* (broad-lobed and narrow-lobed forms), *G. neglectum* var. *rosea*, and *G. neglectum* var. *rosea* sub-var. *cutchica*, have been grown experimentally as pure varieties. The *vera* and *malvensis* forms furnish the most valuable lints, but the coarser *rosea* and *cutchica* varieties yield a higher percentage of lint and would be the more profitable for cultivation in the Central

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(1) See preceding abstract (No. 126). (Ed.).

Provinces. In the Tapti valley the finer types predominate ; the others in Berar, Wardha and Nagpur.

The variety of native cotton known as "Bani" (*G. indicum*) yields a fine silky staple, but as the yield per acre and the percentage of lint are low its cultivation has been given up in favour of "jari." "Buri" has been introduced and has done better than jari on certain rich "khari" lands. So far it has proved immune to wilt disease (*Fusarium vasinfectum* Atk.) and is in demand where this disease is prevalent.

Experiments designed to ascertain the relative values of the outturns of the above mentioned cottons have been carried out at the Akola Experimental Farm during several seasons.

The plants were grown on the deep black soil characteristic of the cotton tract and were manured with cattle dung at the rate of 40 lbs. of nitrogen per acre. The results of the experiment are shown in the following tables :

	Average outturn of seed cotton per acre for four years	Percentage of lint 1910-1911	Average value outturn for four years calculated from rates for 1910-1911
	lbs.		£ s d
G. neglectum, malvensis	373	30.00	3 16 5
G. neglectum, vera	343	33.60	3 18 11 1/4
G. neglectum, rosea	402	40.00	4 13 1 1/2
G. neglectum, rosea cutchica	412	36.30	4 7 11 3/4
Berar « jari »	371	35.70	3 17 8 3/4
« Buri »	203	33.00	3 17 3
« Bani » (*G. indicum*)	255	29.00	2 18 10 1/2

These samples from Akola were of high grade for Indian cotton, but they were of somewhat inferior strength. With the exception of "cutchica" they were all of a much higher class than "superfine." The growing of these cottons should be encouraged in prefernce to the inferior "jari" varieties, which are now so largely produced.

Cottons of the United Provinces. — The chief cotton produced is of an inferior grade, known as Bengals. Several crosses have been obtained of this cotton which give promise of being a considerable improvement on existing varieties, but none are quite satisfactory and probably the introduction of some form of Upland would be advisable.

The two samples received by the Imperial Institute for examination were specimens of indigenous varieties grown at the Government Agri-

Results of the examination of the samples of cotton received from the Akola Experimental Farm.

	«Buri» acclimatised «American Upland»	«Bani» (*G. indicum*)	Broad-lobed *Malvensis*	Narrow-lobed *Malvensis*	*Vera*	*Rosea*	*Cutchica*	«Jari» (*G. neglectum*)
Fibre yield on ginning . .	30.8 to 33.15	25.15 to 27.5	28.2	28.45	33 to 33.7	40.55 to 40.6	34.8 to 38.5	32.1 to 37.8
Lint per 100 seeds, grams.	3.4 to 3.9	1.60 to 1.85	2.2	2.4	2.36 to 2.9	3.25 to 4.3	3.03 to 3.4	2.3 to 3.4
Length of staple, inches .	0.7 to 1.3	0.7 to 1.1	0.7 to 1.2	0.7 to 1.2	0.7 to 1.1	0.6 to 1.2	0.55 to 1.0	0.6 to 1.2
Average diameter, inches .	0.00074	0.00069	0.00083	0.000[illegible]3	0.00082	0.00088	0.00091	0.000815

cultural Station, Aligarh. One, the white-flowered country cotton (Rui), yielded on ginning 40.5 per cent. of lint, or 3.26 grams per 100 seeds. The staple was short (from 0.5 to 1 in). and coarse (average diameter 0.0009 in.); and the other, yellow-flowered country cotton (Rui), yielded 35.7 per cent. of lint, or 2.39 grams per 100 seeds, the length of the fibre varied from 0.6 to 1.1 in. and the average diameter was 0.00081 in.; this cotton was of good quality but somewhat deficient in strength.

Cottons from Eastern Bengal and Assam. — Cotton is grown on a commercial scale only in the Garo Hills and Chittagong Hill Tracts. In both localities the variety grown is *Gossypium arboreum* var. *assamica* Watt, but the ginning percentage of the Garo Hill cotton is considered to be slightly higher than that of the other locality (50.1 per cent. against 43.5 per cent. in the samples examined at the Imperial Institute); the fibre of both samples was rough short (0.7 to 0.8 in.).

Cotton from Burma. — Experiments in cotton growing have been carried out at the Mandalay Agricultural Station, the work being confined for the present to the trial of introduced cottons and the classification of the indigenous cottons. The perennial or tree cottons have not been satisfactory. In the following table a summary is given of the results obtained in the years 1909 and 1910, together with the results of the examination at the Imperial Institute. The annual cottons were sown in drills three feet apart, without manure.

It would appear that the Egyptian varieties are less suited to the conditions of the localities in which the samples were produced than the American and "Cuban" cottons. All the samples, however, were of marketable quality, but with the exception of the "bani" variety they were rather lacking in strength and were slightly stained, doubtless by insect pests.

Variety	Yield of Seed cotton — lb. per acre	Percentage of lint by ginning	Weight of lint per 100 seeds — grams	Length of fibre — inches	Average diameter of fibre — inches	Colour of fibre
Abassi (first year) . .	416	30.5	3.6	1.3 to 1.6	0.00067	Cream colour
Abassi (second year) .	150	35	5.0	1.1 to 1.4	0.00066	Pale reddish brown
Mitafifi (second year) .	750	33	5.3	1.2 to 1.6	0.00065	Pale reddish brown
Cuban (new seed) .	390	28.5	3.3	0.8 to 1.1	0.00086	Pale cream
Georgia Upland (new seed)	250	31.5	3.5	0.9 to 1.1	0.00074	Pale cream
Bani (first year) . .	—	26.9	1.75	0.8 to 1.2	0.00068	Greyish-white
Cambodia	—	38.5	5.6	0.7 to 1.3	0.00073	Pale cream

SUGAR CROPS

128 - The Cultivation of the Sugar Cane in Louisiana.

SPAHR (Hohensholm, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana. A. Die Zuckerrohrkultur (1). — *Der Tropenpflanzer*, 16th Year, No. 10, pp. 517-526 + 5 figs. Berlin, October 1912.

The yearly consumption of sugar in the United States is 80 lbs. per head, being inferior only to that in England where it reaches 86 lbs. per inhabitant. The United States produce about one quarter of the sugar they consume, namely about 900 000 tons a year. Another quarter is imported from the American possessions: Hawaii, Porto-Rico and the Philippines, and the rest chiefly from Cuba. Of the sugar produced in the United States about 350 000 tons are cane sugar, of which southern Louisiana produces 325 000 tons (1910), which with the by-products is worth upwards of £6 200 000.

Area of cultivation. — The chief area on which sugar cane is raised extends southwards from the confluence of the Red River along the west bank of the Mississippi and its former emissaries. The breadth of the cultivated land varies from a few hundred yards to three English miles. Behind the cultivated belt the wooded swamps, in which the drains flow, are situated. The sugar belt comprises about one million acres of land, of which about 300 000 are yearly under sugar, and the rest under maize, rice, potatoes, pulse, lucerne, etc. The cultivation of sugar canes might be extended to about 9 millions of still virgin soils; on the other hand, if the protective duties on sugar were abolished the cultivation of sugar canes would be condemned to disappear; consequently the erection of new sugar factories and the increase of the area under canes proceed very slowly.

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(1) An abstract of the article on cotton appears as No. 125 above. (*Ed.*).

Varieties cultivated. — 1) "Louisiana" or "Domestic" cane, with red cane and slanting leaves; it is suitable for clayey soils.

2) "Ribbon": red cane striped with white, slanting leaves, very resistant to moisture and suitable to clayey soils.

3) "D. 74": dark green cane, erect leaves, high sugar content, fairly resistant to moisture and to drought, adapted to loose soils that do not cake.

4) "D. 95": with purple epidermis and parenchyma, erect leaves; maximum sugar content, but requiring a rich soil.

The first two varieties, originally from Java, were introduced in 1820 and soon replaced all other canes; the other two varieties were distributed in 1900 by the New Orleans Sugar Experiment Station, which had selected them from a number sent by the Royal Agricultural Society of Demerara. They are distinguished by their high sugar content and by their tillering.

The two first named sugars are either consumed as such, or together with the 96 per cent. sugar are sent to the refineries.

Production. — In average years the yield is about 31 cwt. of sugar per acre on light soils and 21.6 cwt. on heavy soils; in favourable years the yields rise to 48½ and 36.8 cwt. per acre respectively. In dry years the amount of canes harvested is lower, but they are richer in sugar than in wet years.

Cost of production. — The cost of production is much higher in Louisiana than in the other sugar producing countries, being 3.75 cents, (1.84 *d.*), while in Java it is 1.5 cents (0.73*d.*), in the Philippines 1.75 (0.85*d.*) and in Cuba 2 cents (0.98*d.*) per pound of raw sugar. This is due to the light harvests and to the high rate of wages, especially of the managing staff.

This state of things, however, is improving in the sense of a greater division of labour between the sugar cane farmer and the mill owners.

Insect Pests. — Of late years the cane borers have caused much mischief, the loss amounting sometimes to as much as 25 per cent. of the crop. The causes of the increase of these insects lie in the imperfect selection of the seed canes and in the neglect of the advice given by the Louisiana Sugar Cane Experiment Station to burn the infected parts and to destroy *Sorghum vulgare* and *S. halepense*, both of which are host plants of the cane borer.

129 – Sugar Cane Cultivation and Sugar Industry in Peru for 1911 (1).

PAZ, CARLOS ROMERO. Statistics for the Sugar Industry for 1911. — *Peru To-Day*, Vol. IV, No. 8, pp. 424-429. Lima, November 1912.

The Section of Statistics, Direction of Agriculture and Irrigation, Ministry of Fomento and Public Works of Peru, of which the writer is the chief, has compiled the statistics of the sugar industry in Peru for the year 1911. In the present paper the most important data are given, some of them being collected in the form of tables.

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(1) See Nos. 1274 and 1342, *B.* Sept. 1912. (*Ed.*).

Sugar cane is grown in all parts of Peru where the climate is warm, but its centre of cultivation is in the coast region. This coast region is practically a plain 1400 miles long by 30 or 40 miles wide and is formed by the erosion of the western base of the Andean plateau. Excepting in the extreme north, it is very dry, but it is crossed by some sixty valleys of great fertility.

The rivers which water these valleys bring down enormous quantities of water during the seasons of heavy rains and of melting snows, the greater number of them however almost drying up during the rest of the year. The overflow from these rivers has contributed to the formation of these productive lands, which are of an alkaline character, some of them containing a considerable quantity of chlorides, sulphates and carbonates, soluble in water. The lands where canes are cultivated are generally rich in lime, compared with the cane lands of other countries. Phosphoric acid is everywhere sufficient, as well as potash. There is plenty of nitrogen, but the quantity varies with each section.

Up to the present only three varieties of sugar cane are known in Peru, the white or yellowish white, the greenish yellow and the red or purple. Some foreign varieties have been introduced, one from Demerara and another from Hawaii, but neither seems to be superior to the sugar cane of Peru. The plant diseases are fortunately not very formidable and the only one worthy of the name is known as "barreno" or borer, though it has not yet done any serious damage. In some valleys a caterpillar has been found, which eats the leaves of the plants. Field rats do very slight damage. Among the accidents to which the cane is liable there are: falling down, to which the white variety is especially subject, and early flowering.

The saccharine percentage of Peruvian canes may vary from 17.5 to 12; this is due principally to the methods of cultivation. Generally the sugar cane has much fibre, plenty of sugar and slight humidity. The juice is generally good and pure and it is readily manufactured. It is seldom necessary to refine the juices; the sugars produced are of good colour, and a rather coarse grain, with high polarization and generally of easy crystallisation.

While in many districts from 18 to 24 months are needed for the cane to ripen, in other parts of the coast only 16 months are required. On some lands under favourable conditions, up to 90 tons of cane per acre may be obtained, and in some plantations an average of 60 tons and even more, by intensive cultivation. At the present time the average production in the good plantations is probably from 35 to 45 tons per acre.

The following table gives a general idea of the average quality of the sugar cane of Peru:

Saccharine matter	15.77	per cent
Fibre	15.00	,,
Moisture	66.02	,,
Density (Beaumé)	11.7	
Brix	20.87	per cent.
Pure juice	89.68	,,
Saccharine	18.71	,,
Sediment	00.47	,,
Glucose	00.45	,,

Sugar cane was introduced into Peru about the year 1570, and for a long time it was grown on a very small scale. The present sugar industry dates back thirty years. It is located chiefly in the coast region; the production of sugar cane in the *sierra* and *montaña*, which is limited in quantity, is used largely for the manufacture of *chancara* (an alcoholic beverage) and alcohol, which is totally consumed on the spot.

Nearly all the great sugar cane plantations have powerful mills, where they not only grind their own cane but that of neighbouring planters; sometimes they buy the sugar cane from those who have no mills, paying according to the quality and the price of sugar in the great centres, or they grind the cane and receive from 30 to 50 per cent. of the sugar resulting therefrom.

Continuous cutting and grinding are possible in Peru.

The National Tax-Colletion Company furnishes the following data on the sugar industry in Peru in 1911.

Exportation :		
White sugar	91 819	cwt.
Granulated sugar	1 966 030	»
Syrups	374 680	»
Consumption of sugar :		
White sugar	639 644	»
Production of alcohol from cane :		
Cane alcohol	1 361 729	gallons

The data collected and, for alcohol, partly calculated by the writer give somewhat higher figures, namely:

Production of sugar	178 533	tons
,, of alcohol	2 127 070	gallons

Two tables are annexed to the paper; they give the data concerning the production of the various valleys of the coast belt. The following are the totals:

Cane ground	1 285 170	tons
White sugar	22 525	,,
Granulated sugar	105 546	,,
Syrups	21 926	,,
Chancaca	1 026	,,
Alcohol	782 713	gallons
Rum	496 357	,,
Number of labourers	16 977	
Average daily wages	2s. 4 ¾ d.	

130 - Seedling Canes in India.

BARBER, C. A. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 317-330 + plates XLI-XLVIII. Calcutta, 1912.

After comparing the respective advantages and disadvantages of the "vegetative" and of the "sexual" reproduction of cultivated plants, the writer considers the economical value of the production, by means of seeds, of good varieties of sugar canes, especially of hardy and productive varieties capable of resisting the diseases which are always spreading and becoming more serious, and of holding their own against the competition of sugar beets.

Experiments with the object of obtaining new varieties of sugarcane were carried out in all sugarcane growing countries, especially by the Agricultural Departments in Java, the West Indies, British Guiana, the United States and Mauritius; but it was soon discovered that the great bulk of these seedlings were of inferior character, many apparently reverting to what one might suppose was the original wild form of the plant.

A long labour of selection became necessary. As an instance it may be mentioned that in five years in Barbados some 20 000 seedlings were raised and that less than 1 per cent. of them are likely to prove of ultimate value. In the same time in British Guiana about 330 000 seedling canes were produced, and it is surmised that of the whole number perhaps a dozen may be added to the canes grown in the country.

In Java before 1850 there was practically only one kind of cane grown, the White Cheribon. In that year a planter noted a red cane among the rest: he separated it out and multiplied it. As it proved hardier, more productive and provided with a richer juice, it rapidly replaced the older white cane in many parts of the island. In 1882, however, a planter in the extreme west of Jave noted that his canes were stunted, developed many aerial roots and multitudes of side branches, resembling the curious bunching growth frequently noticed in South India when the canes are irrigated with alkaline water or cropped for several seasons without change of seed. Around Coimbatore this form of growth is known as "shuleh kutteh" and in Java as "sereh" (1). In 1892 this disease had reached the extreme eastern point and entered the island of Bali. It was noted that ratoons were much worse affected than plant canes and that the fields in the hills were comparatively free from the disease. The old plantations were accordingly renewed with seed canes from the hills. It was estimated that in one year alone some £200 000 were lost to the island through the disease, and this when the crisis produced by beet sugar was beginning. In order to solve the difficulty, several scientific sugar stations were founded to study the plant in all its aspects. They imported into Java canes from various countries, among which the Indian variety called Chunnee. A number of these introduced varieties proved to be more resistant to the disease than the local canes, but none were considered completely satisfactory. Recourse was then had to the production of canes by means of seeds, the Indian Chunnee being largely used as a parent ; and with good results. Besides being disease-resistant some of the seedlings can resist drought, while others stand excessive moisture; some ripen early and others late, thus continuously supplying fresh canes during the whole of the milling season.

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(1) See p. 361 *B.* Dec. 1910; No. 1541, May 1911. (*Ed.*).

As a result, it may safely be stated that the Java sugar industry is in a very much better position than it was before the appearance of sereh, the output having risen in 1911 to 1230 000 tons, placing Java only second to Cuba among the exporting countries.

The cane sugar industry in India is in an unsatisfactory condition. Most of the better-class canes are heavily diseased or, as in Madras, they are grown on a very small scale, and the hardier and more widely spread varieties are among the poorest in the world.

Consequently the improvement of the sugarcane by means of seedlings has an immediate practical importance. Experiments with this object in view have been made in various localities in India ; those carried out at the Samalkota sugar station in the Madras Presidency led to the production (by seeds obtained from the cultivation of imported varieties) of good varieties; none of them, however, are really immune, and hardly any are suitable for introduction into the large areas under cane in Northern India.

The writer has started at the College of Agriculture at Coimbatore the work of breeding and selecting varieties of sugarcane, both local and imported from other parts of India, as well as the histological study of their reproductive organs. The canes flower very freely, but the formation of seed is comparatively rare. The writer has ascertained that this is due to the infertility of the anthers, which often do not open(1). Thus in the varieties Java 36, Java 247, Chin, Desi Saretha and Dhaula Saretha he did ntot find any anthers open. In Striped Mauritius, Red and Green sports from it, Barbados 1529, Fiji B, and Vellai he found from 0.5 to 4 per cent. open, while in Red Mauritius, Cheni and Purple Mauritius the percentage of open anthers rose to 30 to 70 per cent. Of these varieties only one, the Cheni of Mysore, is a native of the country. Perhaps it is the same as the one which, under the name of "Chunnee", was imported into Java from India and extensively used as a parent in the crossing experiments.

Owing to the prevailing infertility of the local canes, there is not much to fear from self-fertilisation, and this facilitates the work of crossing and selection. Both the Cheni and the Red Mauritius are in addition excellent canes in their way, more or less hardy and to a certain extent immune from local diseases ; it is expected that they will render good services in the production of new Indian varieties. The writer concludes by reporting upon the present state of the work of selection and botanical classification which he has begun.

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(1) See No. 1628, *B.* Dec. 1912. (*Ed.*).

RUBBER,
GUM AND RESIN
PLANTS

131 - The Nitrogenous Constituent of Para Rubber and its bearing on the Nature of Synthetic Rubber.

Beadle, Clayton and **Stevens, Henry P.** in *Journal of the Society of Chemical Industry*, Vol. XXXI, No. 23, pp. 1099-1103. London, December 16, 1912.

Gladstone and Hibbert were the first to indicate the nitrogenous character of the insoluble part of Para rubbers (those from *Hevea brasiliensis*), which is left as a sort of network after solution of the hydrocarbon (*Journal of Chem. Soc.* 1888, p. 680).

The writers have shown that the insoluble matter derived from Para rubbers of various sources is highly nitrogenous in all cases, and contains up to 7 per cent. of nitrogen, and that the presence of nitrogen in the soluble portion only occurs in rubbers which have received some mechanical treatment; such treatment disintegrates the nitrogenous network.

Results with smoked sheet rubbers have already been given; in this paper those from non-smoked rubbers and rubbers of sources other than *Hevea* are described.

A sheet of plantation rubber was cut into small pieces and allowed to soak in twenty-five times its weight of benzene; after several days the upper layer was carefully decanted and replaced by fresh benzene; after another week or two the clear upper layer was again decanted and added to the first portion and the rubber recovered by spontaneous evaporation: this rubber was of a pale golden colour. The lower portion of the solution, containing the dark nitrogenous insoluble matter, was similarly evaporated, and gave a dark coloured rubber. It therefore appears that most of the colouring matter in dark rubber is due to the insoluble matter. As the dark colour is brought about by the action of oxydases, it is probably the non-caoutchouc constituents which are oxidised rather than the caoutchouc itself.

The following specimens were tested: 1) the rubber not treated; 2) a portion allowed to swell in benzene and then evaporated spontaneously; 3) the lower half of a solution in benzene containing the dark insoluble matter and 4) the upper pale solution.

Analyses of the unvulcanised rubbers.

	1)	2)	3)	4)
Acetone extract per cent.	2.48	2.52	2.32	3.04
Nitrogen per cent	0.475	0.462	0.840	0.070
Calculated as protein	2.97	2.89	5.25	0.44

These samples were masticated and vulcanized under uniform conditions, so as to contain 7 per cent. of sulphur. The sheeted compounds were then cured alongside one another in steam for three hours at 35, 45, 55 and 65 lbs. per sq. in. (exclusive of atmospheric pressure). The second of these cures was ample for vulcanizing 1), 2) and 3); specimens 1) and 4) were submitted to the higher cures to find suitable conditions for vulcanizing 4).

Analyses are given of the vulcanized rubbers as well as a diagram of tests made in the Schwartz hysteresis machine. The breaking strain and elongation were also determined.

Mechanical tests on vulcanised rubbers.

	1)	2)	3)	4)
Cure 3 hours at 35lb. pressure.				
Tensile strength . .	59	53	75	13
Elongation, per cent	910	950	840	710
Cure 3 hours at 45lb. pressure.				
Tensile strength . .	100	100	95	33
Elongation, per cent	740	780	600	1140
Cure 3 hours at 55lb. pressure.				
Tensile strength . .	50	—	—	41
Elongation, per cent	470	—	—	960
Cure 3 hours at 65lb. pressure.				
Tensile strength . .	40	—	—	30
Elongation, per cent	380	—	—	400

While it is open to question how far the quality of the rubber was improved by the presence of more than a certain proportion of insoluble matter, there would appear to be little doubt that its removal resulted in deterioration. No. 4) is undoubtedly inferior; although 10 or 20 per cent. more distensible than the untreated rubber, its tensile strength (maximum only 40 per cent. of untreated rubber) and other physical qualities were strikingly inferior. Rambong and Ceara appear to behave similarly to Para, although the former contains much less and the latter much more nitrogen.

Obviously synthetic rubber cannot contain any insoluble nitrogenous matter of the character of that found in natural rubber, and to add it so as to obtain the reticulated structure would probably be impossible. It therefore seems reasonable to expect that synthetic rubber would have much the same properties as sample no. 4).

In previous experiments the writers have shown that the removal of the greater part of the resins from such rubbbers as Para grades and Rambong results in a marked deterioration, as shown by the difficulty in vulcanising and the lower figures yielded by the extracted rubbers. It would therefore also be necessary to add resins to synthetic rubber; but the experiments of Seidl show that not all resins have the desired effect, that of jelutong for instance, being useless. Experiments by L. E. Weber (*Journal of the Society of Chemical Industry*, 1912, p. 888) have confirmed the observations of the writers as to the difficulty of vulcanisation after removal of the resins.

132 - Contribution to the Study of Rubber in the North of Madagascar.

HAMET, H. and JOSSE, L. : Contribution à l'étude du caoutchouc dans le Nord de Madagascar. — *L'Agriculture des pays chauds*, 12th Year, Nos. 115 and 116, pp. 265-274 and 372-379. Paris, October and November 1912.

The rubber plants found in the north of Madagascar are numerous. Among Landolphias, *L. madagascariensis* is a liana of considerable length, up to about 100 feet, with a diameter at about 3 feet up of 4 to 5 inches. Its yield in rubber varies from 6 to 25 per cent. of the latex ; the rubber, which is rose-coloured, soon turns brown on exposure to the air; the best yields are those obtained during the warm weather; the best rubber is had by tapping the stem and the adult branches. It is classed among the good average sorts and is worth about 60 per cent. of Para rubber.

Landolphia Perieri gives a rosy-white rubber, full of nerve, very elastic, keeping very well, but the yield is very slight, varying from 4 to 17 per cent. according to the season.

L. sphaerocarpa, called "Reiabo" by the Sakalaves, yields a very abundant latex containing from 18 to 26 per cent. of fine quality rubber. This liana is the most interesting among Landolphias, and in case of plantations the writers are of opinion that it is the one that ought to be multiplied.

"Lombiro" (*Cryptostegia madagascariensis*) yields a good quality latex with a rubber yield of 15 to 20 per cent., and great care is taken to coagulate the latex from the adult branches. It is a kind easy to multiply by cuttings, layering and seeds.

"Bokalahy" (*Marsdenia verrucosa*) yields abundant latex, giving 10 to 12 per cent. of good rubber.

The various species of *Mascarenhasia* are called indiscriminately "Barabangas" by the natives. The rubber produced by these different species is the kind called "Black rubber of Madagascar," and is quoted at 50 to 60 per cent. of the price of Para.

The distribution of these species is described in detail by the writers. "Lombiro" is found all along the coast on the dunes swept by the sea winds; the Landolphias grow under the shelter of the forests and of the edges of the wooded islands forming the great bush ; the "Barabangas" seem to adapt themselves to the white quartz sands and cover the banks of water courses and grow even in the beds of torrents. All these various rubber lianas are endangered by bush fires and by the violence of the waters ; it would therefore be necessary to delimitate the areas which are suitable to the production of rubber and a good deal would have to be done to induce the natives to produce a better prepared rubber of a more constant quality.

The high value of plantation products is due especially to their state of purity ; it is therefore necessary to increase the production and the value of Madagascar rubber. It is for this reason that the writers have very attentively followed the various operations that the natives carry out for extracting rubber, and they have led them to intruduce, under their surveillance, some modifications in their special technique, especially with a view of making them :

1) Free the latex from the impurities it may contain.
2) Treat it immediately upon its extraction from the plant.
3) Disinfect it preliminarily, to ensure its preservation.
4) Use a coagulent to the required degree of acidity.
5) Filter the coagulant.
6) Use an excess of coagulant in the latex.

Samples of rubber thus prepared by the natives were submitted to the judgment of experts at Havre and Antwerp.

The following are the results of the comparison of the above rubbers with Ceara plantation rubber, Java, Manihot and Ceylon Para.

	I Lombiro — per cent.	II Landolphia — per cent.	III Ceara — per cent.	IV Manihot — per cent.	V Ceylon — per cent.
Moisture	1.2	1.8	1.2	0.8	0.3
Ash	0.5	0.15	0.7	1.2	0.4
Resin	8.75	7.2	7.7	5.2	2.95
Resistance to heat : 10 hours at 70° C.	well preserved	well preserved	fairly well preserved	well preserved	fairly well preserved

The qualities I and II can thus bear comparison with the finest sorts of second rate rubbers.

The writers explained also to the natives that they allowed an appreciable quantity of rubber to be lost by abandoning the branches that are cut, and that by barking and pounding them, 100 lbs. of abandoned branches would yield 8 lbs. of rubber similar to the fine sorts called " Benguelas " and also " Mozambiques."

This system of extraction, which, in order to be productive, should be carried out by machinery, offers the great advantage of allowing the treatment of branches that would otherwise be wasted, of plants with very thin stems and of those slow growing kinds for which this method is more advantageous than tapping.

In order to ensure the future of Madagascar from the point of view of the production of rubber, the first thing to be done is to stop the devastation and destruction of the spontaneous indigenous stands, and to increase the production of the country ; the existing species should be multiplied or the best American kinds should be introduced, as they have been in Malaysia. The latter solution seems the best, for whilst Heveas for instance, could give as much as 267, 357 and even 410 lbs. per acre, with lianas, calculating on 400 plants per acre, one could not have more than 107 to 116 lbs. per acre at the utmost. But the fact must be borne in mind that the experiments made of transplanting Heveas as well as Cearas and Castilloas have not yet given conclusive results and that on the other hand the development of a plantation of indigenous rubber-bearing species in Madagascar seems likely to give good results.

133 - **Rubber Examined at the Imperial Institute** (1).

1. — Rubber from Ceylon.
2. — Rubber from Papua.
3. — Rubber of *Hevea confusa* from British Guiana.

Bulletin of the Imperial Institute, Vol. X, No. 3, pp. 380-383; 386-388; 388-389. London, 1912.

1. *Ceylon Rubber.* — At the Experiment Station at Peradeniya, Ceylon, a series of tapping experiments was carried out to determine the relative value of excision and incision methods as applied to *Hevea brasiliensis*, the tapping being performed 1) by the knife only (incision), 2) by the pricker only (incision) and 3) by a combined method using both knife and pricker. The results of the chemical examination of the rubber, which was analysed at the Imperial Institute, proved that the different methods were nearly equal. Two specimens obtained by making V and half-spiral incisions were practically identical, though the crêpe resulting from the third method was a little inferior to that obtained by the first two. The biscuit obtained by the third method was a little superior to that due to the first.

In 1906, several new rubber-yielding species of Manihot (*M. dichotoma*, *M. heptaphylla*, and *M. piauhyensis*) were discovered in Brazil and were stated to be superior to *M. Glaziovii* and therefore introduced experimentally into a number of countries. In Ceylon, *M. dichotoma* is stated to thrive better than the Ceara tree (*M. Glaziovii*). Samples of rubber from young trees of the first species were prepared at the Experiment Station at Peradeniya and analysed at the Imperial Institute; the rubber in composition was of very fair quality (84.6 per cent. of caoutchouc), although the percentages of protein (5.7), insoluble matter (4.3) and ash (2.9) were rather high.

2. *Rubber from Papua.* — The chief rubber-yielding plants indigenous to Papua are *Ficus Rigo* and a species of vine, which has so far not been determined. *F. Rigo* is a tree, which is chiefly found in the Rigo district, where it is known by the natives as "Maki;" it furnishes rubber of good quality, which is collected by the natives for export. Experimental plantations of the tree have been formed in the island. The rubber yielded by the vine is also of very fair quality.

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(1) For further information on this subject see also: *Colonial Reports, Miscellaneous*, No. 82. *Imperial Institute. Selected Reports from the Scientific and Technical Department: IV, Rubber and Gutta Perca.* London, 1912. (*Ed.*).

3. *Rubber of* Hevea confusa *from British Guiana.* — *Hevea brasiliensis* is not indigenous to British Guiana, but it has been introduced for plantation purposes and promises to do well in the Colony. Several other species of *Hevea* are, however, natives of the above-mentioned country, and of these the most widely distributed is *H. confusa* (Hattie or Sibi). The rubber furnished by this plant has hitherto been regarded as of little commercial value, but the present sample, which has been analysed at the Imperial Institute, though deficient in elasticity and tenacity, is of very satisfactory composition.

Caoutchouc	92.3 %
Resin	1.8 ,,
Protein	4.9 ,,
Ash	1.0 ,,

The yield per tree is small, even under cultivation (British Guiana, Jamaica, Java). At Buitenzorg, twenty-year-old trees, with a girth of from 40 to 50 inches breast high yielded only 0.35 oz. of dry rubber per tree.

134 - The Cultivation of Cigar Tobacco with Special Reference to Java.

VARIOUS CROPS.

The Bulletin of the Imperial Institute, Vol. X, Nos. 2 and 3, pp. 148-263 and 465-470, London, 1912.

The United Kingdom imported in 1910 no less than 111 257 544 lbs. of unmanufactured tobacco, valued at £3 435 493, of which only 1 471 102 lbs., valued at £45 987, was derived from British sources (almost exclusively British North Borneo, India and Jamaica). The writer is of opinion that it would be desirable to extend the growing of tobacco in the British colonies; he considers the question under its various aspects and as a contribution to its solution he gives an account of cigar tobacco cultivation and preparation as it is carried on in Java.

All the tobacco estates in Java are situated in the Vorstenlanden or Principalities (of Djocjokarta and Soerakarta or Solo) and are mostly situated near Klaten in the principality of Soerakarta. The chief estates subscribe a definite sum per annum to the Department of Agriculture for the upkeep of the Tobacco Experimental Station at Wedi or of the General Experimental Station of Salatiga, which includes a special tobacco section with a laboratory at Klaten.

Land Tenure and Labour. — In the Vorstenlanden all the land is looked upon as belonging to the native prince, and one-fifth of it is regarded as appertaining to him personally. A portion is employed to meet the administrative and other expenses of the principality, the rest is allocated to the use of the royal family, court officials, etc. Part of the land has been let to the tobacco undertakings, nearly all European, usually on long leases, with certain rights to the labour of the natives who live on the land. One-fifth of the land let to a tobacco undertaking is at the disposal of the "Bekel," the intermediary through whom the land is leased, and he may either cultivate the land himself, or re-let it to the planting company. The remaining four-fifths of the land is divided into two parts, one of which is planted for the company by the peasants, and the other is reserved to the peasants on the estate, for their own cultivation. The two parts are interchanged annually so that the benefits of a rotation of at least one crop, usually rice, with the tobacco are obtained.

The services the peasant must perform on the land which he cultivates include the preparation of the soil, the preparation and care of the seed beds, the planting out of the tobacco seedlings, the care of the growing tobacco and its irrigation. The estate lessees provide and pay specially for the transport and application of manure, the construction of large drains, deep tillage, the harvesting and transport of the tobacco crop, and for the curing, fermentation and grading of the tobacco. The rates of pay for coolies are about one shilling a day.

Climate. — The tobacco season in Java lasts from March to December. The plants complete their growth in about 2½ months. The climate is moist throughout the whole year, though there is a relatively dry season from June to October. The temperature is nearly uniform, rarely inferior to 20° C. or superior to 35° C., with variations of the monthly mean temperatures of only one or two degrees.

Soil. — The upper layers of the soil are composed almost exclusively of very fine sand and clay of volcanic origin. This material is composed essentially of andesite, which contains from 0.5 to 1.34 per cent. of potash. The soils at the foot of the volcano Merapi contain 0.05 to 0.10 per cent. of total nitrogen, 0.01 to 0.17 per cent. of phosphoric acid and 0.04 to 0.12 per cent. of potash; they are all the richer in phosphoric acid and potash the nearer they are to the volcano.

Cultivation. — Leguminous crops are grown on the land for several years before it is used for tobacco. After a certain time sugar-cane follows tobacco. At the end of December, when the tobacco has been harvested, dams are erected round the field and the latter is flooded for rice cultivation. The rice has been sown in seed beds forty or fifty days previously and the young plants are transferred to the field. About a hundred days later the rice is ripe and ready for cutting (January to May). The land is then harrowed twice, ploughed and again planted out with rice, and after another hundred days (June to October) these operations are repeated for a third crop of rice (November to March). So that three crops of rice are obtained between each two tobacco crops. The average yield per crop of rice is 7228 lbs. per acre (100 piculs per bouw), and of tobacco 1445 lbs. (20 piculs per bouw). Where there is not enough water to permit of rice cultivation, maize, soy beans, ground nuts, or "dry rice" are grown between the tobacco crops. Water being very important in tobacco cultivation, a system of reservoirs, canals, etc., has been constructed with a view to conserving and using the supply.

Preparation of Soil. — After the third harvest the rice straw is removed and used partly as buffalo fodder and partly as fuel for sterilising the seed-beds. The chief gutters are then dug out (150 ft. apart, about

1 ½ ft. wide and 4 ft. deep); they are generally made in a new place every year; the land is then ploughed and manured and ploughed again twice, after which a second system of parallel gutters is constructed. These are about 10 in. wide and 1 to 2 ft. deep and lie about 30 ft. apart, running at right angles to the first set, which is made in the direction of the slope of the land. The whole field is then surrounded by a ring-drain. The plots thus formed are ploughed again three times. The land is then marked out for planting, pieces of split bamboo indicating the positions the tobacco seedlings are to occupy, at intervals of 1 ft. 6 in. along rows 3 ft. apart.

At this stage the middle two feet of the three-foot space is worked by the patjol (a kind of broad mattock) to a depth of 1 ¼ to 1 ½ ft.; the remaining 6 in. on either side of the bamboo marks is worked to a depth of 9 in., except close to the bamboos, in order to allow the young plants to root more firmly. Another method of working the soil consists in breaking it up in strips and leaving the subsoil of each alternate strip exposed to the air for some time. Whichever method is adopted, on the whole the working of the soil is done with great care.

Manuring. — Practically the only manure used is street sweepings (rather poor) and the rice straw that is ploughed in. Green manuring would be advantageous, but it cannot be carried out economically as the fields are already occupied almost continuously by rice or tobacco. The tobacco crop refuse is not used as manure because the commendable practise obtains of burning all this refuse every year to avoid spreading plant diseases.

Seed Beds. — The seed beds are prepared in mid-July, end of July and mid-August, so as to have tobacco in three stages of development. The soil selected for seed beds is ploughed several times and worked over by hand, exposing it as much possible to light and air as a means of avoiding "mosaic" disease. The beds are made 12 ft. long by 4 ft. wide and 1 ft. high, and are provided with drainage and irrigation ditches. Water is supplied in them during the first five days to flood the seed beds and destroy ants. Three days before the seed is sown rice straw is spread on the beds and after it has lain one day to attract insects it is burnt Around each bed a bamboo framework is made, on which mats can be placed to afford shade when necessary.

The beds are well smoothed over and flattened, and the seed sown at the rate of 0.5 gram per bed; for the first five days the beds are watered; after eight days thinning out begins. As a rule 3000 plants are raised on each bed, or about 60 per square foot. Some consider this too high and recommend 20 per square foot. Beginning on the sixth day the beds are sprayed with Bordeaux mixture every five days. On the twelfth day the shade is removed during the cooler parts of the day, and from this time onwards the duration of shading is reduced each day, and by the thirtieth day the plants should be ready to do without any shade and the covers are not replaced unless heavy rain falls.

The young plants are planted out in about thirty-five to forty days after sowing, on thoroughly watered ground, and are watered daily for the first seven days.

The rest of the cultivation consists in breaking up the soil round the plants whenever it becomes hard, in heaping soil round the bases of the stems, in removing and burning weak or diseased plants and replacing them.

Harvesting. — In general the tobacco is not topped, nor are the suckers removed. The leaves are picked singly in the early morning, when they are poorest in starch, beginning with the bottom leaves. As a rule eight bottom leaves, ten middle and six top leaves are obtained, the three kinds being kept separate also in all the successive operations. The leaves are then hung up to dry in the drying sheds, which are fairly well ventilated, but which are allowed the least possible amount of light.

The dry leaves are made up into bundles of fifty to fifty-five leaves each, and placed to ferment in rectangular heaps of twenty layers, each consisting of about 500 bundles. After about five days the temperature rises to 60° C. The heaps are then unpacked and with the contents of every two of them a new heap is made containing forty layers. This unpacking of the heaps when their temperature rises to 60° C. and remaking of larger ones, is repeated usually three more times, thus five in all, care being always taken to place the bundles that were on the outside of the previous heap in the middle of the new one.

Grading. — The sorting of the leaves is done first according to quality, and then according to colour. Six classes are made : 1) complete thin leaves of good texture and free from stains ; 2) as above, but showing fungoid disease stains ; 3) broken leaves, subdivided into four qualities ; 4) leaves showing pressure marks ; 5) leaves showing spots ; 6) thick leaves.

The graded tobacco is made into "hands" consisting of 30 to 40 leaves and the hands are packed under pressure into bales of about 176 lbs. in weight. The tobacco is shipped from Semarang to Amsterdam.

The yield of finished tobacco is about 1260 lbs. per acre, and the average price is about 1 shilling per pound.

Diseases and Pests. — Throughout, a very careful watch is kept for insect pests, and the village children are paid to collect and destroy them. *Phytophthora nicotianae* is very prevalent. The diseased plants are uprooted and burnt, and the holes are filled with a mixture of lime and ammonium sulphate solution. The surrounding plants are sprayed with Bordeaux mixture. After four days, if no further outbreak has occurred a new plant may be inserted in the gap.

Another disease which has proved troublesome is a bacterial disease which attacks the roots in soil newly cultivated, or which has not been worked so intensively as usual, or in which acid fermentation is proceeding. Besides the above, mosaic leaf disease is widespread, but on the whole does very little harm.

135 – The Fuller's Teasel.

DALLIMORE, W.: *Royal Botanical Gardens Kew. Bulletin of Miscellaneous Information*, No. 7, pp. 315-350. London, 1912.

This article is the result of a request received at Kew from a firm at Leeds respecting the increasing difficulty of obtaining a regular supply of teasels, and it also gives bibliographical notices concerning the cultivation of this plant in Great Britain and the United States.

It has not been found possible to construct a machine capable of giving the same finish to cloth as is obtained by the use of the teasel.

In commerce, these heads are known by different names: "king teasel" (the central head, which terminates the main axis and is always the largest); "queens" (found at the ends of the principal branches); "princes," or "buttons" (borne by minor branches). One English firm sorts the teasel heads into 70 different sizes previous to selling them to its customers.

France has perhaps the largest acreage under teasels, and French-grown heads fetch the highest prices, but this plant is also cultivated in England, the United States and Germany.

In England, land is hired from farmers by Messrs. North for the cultivation of one crop at the rate of £6 per acre per year. Ground which will produce good wheat is considered most suitable for teasels and, when possible, a crop of wheat is followed by teasels, the soil being well worked, but not manured. Seeds are drilled into the ground in March of one year for the succeeding year's crop. The ground is weeded in June and again in July, when the plants are thinned out. In October, a further cleaning of the ground and loosening of the soil takes place.

Next year, in March, the ground is loosened and the plants finally thinned, being left about three feet apart each way; any gaps caused by death through damp or frost in winter are filled up. In June and July (the flowering season) a strict watch is kept in view of a possible attack by caterpillars. The harvest takes place in August and September. The heads are dried in sheds with open sides and thatched roofs, which are erected in the fields. The heads mature at different periods, so the plants have to be gone over several times. They are cut with about six inches of stalk, tied up in handfuls, threaded on long poles, and hung in the sheds for about five weeks to dry. They are then taken into a barn, sorted, and tied up into bundles for sale. The price of a bundle varies from 35s. to £24. The annual value of the heads used in England is estimated at about £15 000; while the value of teasels imported in 1911 from France was £8 681, from Germany £295 and from the United States £349.

Regarding teasel culture in England, there appear to be two critical periods: one is during winter, when many plants are killed by the inclement weather, and the other is during the harvest, when a period of wet weather may wholly or partially ruin the crop. On account of this, indoor cultivation has been suggested. An experiment in this direction has been made, but not on a sufficiently large scale to permit of an opinion being formed as to the financial result. In the absence of experience, one would be inclined to consider that such a scheme would be a financial failure, for the gross average income from an acre of teasels is about £70 and this after the ground has been occupied for 18 months, while the necessary expenses of building portable houses, soil renewal, etc., would be very heavy.

There appears good reason to suppose that better results might be obtained by moving the cultural area from Yorkshire and the western counties to Essex and Hertfordshire and perhaps Norfolk and Suffolk. Experiments might be conducted with a view to obtaining a race which would stand the winter well and mature earlier. Seeds should be selected from well grown heads. Experiments ought also to be made in order to save the ground for one summer by sowing seeds thinly on a small area of ground; a crop of wheat could be taken from the rest and the teasels planted out in autumn.

Cultivation in France. — In France, the plant is found to thrive best in a light, gravelly soil with a southern aspect. The seeds are sown in spring and the young plants well thinned out. In August, they are transplanted into rows about 12 to 15 inches apart and are kept well weeded during the winter. Sometimes the teasels are sown in the places where they are to remain and a cereal is grown with them, so that a return may be obtained from the ground during the first year. In the following spring, as soon as the plants have attained a height of from 20 to 24 inches, a number of the side shoots are removed, eight or twelve being left for each plant. Harvesting is commenced when the leaves begin to fall or to turn yellow. When dry, the heads are packed in boxes containing from 25 to 100 each, all of uniform size and colour. In 1909, 3690 acres of teasels were grown in the three districts of Bouches-du-Rhône, Vaucluse and Seine-et-Oise, and the 40 380 cwt. of heads produced were valued at £51 237.

Cultivation in the United States. — In America, it is usual to sow the seeds in drills 3 to 3½ ft. apart with a thin crop of corn. The grain is gathered and the straw left standing to afford protection fom snow during winter. The plants are eventually thinned to eight or ten inches apart in the rows, and harvesting takes place in a similar manner to that adopted in England. The average crop is 100 000 heads per acre (about the same as in England), and the medium price in New York is from 90 cents to one dollar a thousand, though it may drop to 50 cents, or rise to two dollars. One thousand heads are said to weigh ten pounds. Teasel growing forms a local, but important, industry in the States of New York (Onondaga County) and Oregon (Clackamas County).

The cost of growing there is given as twopence a pound for dried heads and the selling price as four pence a pound.

MARKET GARDENING

136 – Fruit and Vegetables in Alaska.

U. S. Department of Agriculture, Annual Report of Alaska Agricultural Experiment Stations for 1911. Washington, 1912.

At the Sitka Experimental Station a hardy strawberry has been produced by crossing the cultivated variety with a wild native Alaskan plant. The new variety appears to be well adapted to the climatic conditions of that region, and gives far better yields than either of its parents.

In the apple orchard, planted in 1903, ripe fruit was produced for the first time in 1911, possibly owing to the exceptionally fine weather during September and early October of that year. The fruiting varieties were all of crab descent.

Cherry and plum trees continue to prove unsuitable to the prevailing conditions ; but currants, raspberries and gooseberries do well and are represented by a number of varieties.

With regard to vegetables : variety trials of potatoes, cabbages, cauliflowers, lettuces and radishes were continued ; the results show that good crops, with regard to both quality and quantity, may be obtained not only in the coastal region of Sitka but also at the interior stations of Rampart and Fairbanks.

FRUIT-GROWING

137 – The Passion Fruit in New South Wales.

ALLEN, W. J. in *The Agricultural Gazette of New South Wales*, Vol. XXIII, Part 11, pp. 975-979. Sydney, November 2, 1912.

The passion vine flourishes on many classes of soils (some extremely poor), and has been found specially useful for interplanting in young citrus plantations in the Cumberland, Penang Mountain and Gosford districts (N. S. W.). Plants may be raised from seed sown in February and the vines planted out in August or September in rows 10 ft. by 12 ft. apart. The young vine is trained up a stake with a single stem to a height of about 5 feet ; then it is allowed to throw out two to four leaders, which are made to run either way along two horizontal wires about 6 in. apart. In the second year after planting, two good crops of fruit are obtained — summer and winter — and by pruning away the summer crop when halfgrown, a large yield is obtained in winter when other fruits are scarce. The yield is maintained for about four years, after which the plants should be grubbed. The vineyards will never succeed in regions exposed to frost, and the land should be limed if necessary and generously treated with fertilizers to obtain good results. The fruit is of remarkably fine flavour, and keeps well in a cool, dry place.

138 – Investigations and Researches Regarding the Effects Produced on the Vine by Grafting.

1. VIALA, P. and PACOTTET, P. Notes et recherches sur l'influence du greffage. — *Revue de Viticulture*, Vols. XXXVI, XXXVII and XXXVIII, Nos. 940-944, 946, 976, 978, 980 and 982, pp. 685-690, 5-7, 33-37, 65-70, 141-144, 233-237, 293-298, 405-411 and 511-517. Paris, December 21, 1911 ; January 4, 11 and 18, February 1, August 29, September 12 and 26, October 10 and 31, 1912.

2. VERDIÉ. Enquête sur les effets du greffage. — *Bulletin de la Société des Agriculteurs de France*, pp. 362-373, and 423-428. Paris, December 1 and 15, 1912.

1. — The theories which have been promulgated during the last few years respecting the reciprocal influence of stock and graft have in no wise modified the practice of reconstituting vineyards by planting them with American vines resistant to phylloxera. Nevertheless, the importance which recent scientific work seems to attach to questions of the reciprocal action of stock and graft was not unknown to vine-growers.

Vine-growers have always been a little afraid as to the effect grafting might have on their vines and the quality of the wines, and all the more since reconstitution with American vines has made grafting general.

The writers, like other vine-growers, have for a number of years made observations in the vineyards as to the influence exerted by the different stocks on the various grafts. These observations have been controlled in a comparative and more scientific manner, by experiments in the different experimental plots set apart for this purpose.

The following is a short summary of their important studies:

"Observations and experiments made in the vineyard and continuously in the experiment field, not for two or three years alone, but extending over a period of fifteen years, show that the variations thought to be due to grafting do not exist and have never existed.

"The numerous facts which we have ascertained by means of comparative observations in the course of this work, have also shown that the characters and qualities of high-class and of ordinary wines are retained or improved by grafting French or European varieties on American stocks."

2. — In 1908, the "Société des Agriculteurs de France" appointed a Commission of Enquiry regarding grafting and its consequences. The work of this Commission was the centralization of the greatest possible number of documents and the control on the spot of the facts collected.

They began by drawing up a question schedule, which was sent throughout France to viticultural syndicates, associations and societies, as well as to the chief vine-growers, for the purpose of collecting all the opinions and known facts for or against grafting. In March 1909, the replies to these questions were divided as follows:

Two hundred and twenty-nine were in favour of grafting.

One hundred and sixty-nine answers were to the effect that there was no difference between grafted and non-grafted vines.

Twenty replies stated that grafted vines were more liable to their grapes running off.

Ten replies testified to the diminuution of resistance to fungus diseases, *i. e.* of defects which are corrected by pruning or staking.

Nine answers mentioned that the wines from these vines were inferior in quality.

Thus, only nine out of four hundred and thirty-seven answers were unfavourable to grafting, as far as the quality of the vines was concerned. It was thus necessary that the facts which had given rise to the most contradictory opinions should be verified on the spot.

The delegation entrusted with this duty made its first tour in the south-west and south, from the 8th to the 22nd of August 1909, and came to the following conclusions:

" From the data collected, it is clearly seen that the objections made to grafting are not sufficiently well-grounded to prove any degeneration or specific modifications due to this practice, as usually effected; provided the requisite conditions of affinity and adaptation are present and that the other vital necessities of the vine are not neglected."

The Commission proposed continuing its studies during the course of the summer of 1910, in Burgundy, Champagne and Franche-Comté, but was prevented owing to the very unfavourable weather. But from the information received from these regions, and which came from absolutely reliable sources, it appears that no facts were discovered which in any way made it necessary to modify the above-mentioned conclusions.

The Commission therefore proposed to the Viticultural Section of the Society that the enquiry should be suspended for the present.

139 - Manuring Vineyards with Tobacco Refuse in Hungary.

RASZO, IMRE.: Szőlőtrágyázás dohányhulladék trágyával. — *Borászati Lapok*, Year 44, Nos. 50 and 51, pp 778-780 and 796-797. Budapest, December 8 and 14, 1912.

This is a study and discussion of the problem of manuring vineyards with tobacco refuse according to the experiments made in 1912 in the vineyards of Count Batthány at Szabadbattyán.

This problem is interesting, as the question of manuring becomes always more urgent in the sandy vineyards of Hungary, where, owing to the insufficient quantity of stable manure, it is sought to introduce other manures rich in organic matter, such as dried pigs' dung and town refuse, the use of which however is more costly than that of tobacco refuse.

The vineyards in which the experiments were carried out were divided into five groups, each of which contained five plots of 1712 square yards each. All of them, save two, were planted with Riesling grapes. Between the rows of vines furrows about 14 inches deep were opened, in which the tobacco refuse, completed by artificials, was placed. The manures were applied in three different doses: medium, heavy and very heavy.

In order to compare the effect and the duration of the phosphatic manures, superphosphates and basic slag were used, the latter also in order to study the effect of the lime it contains on the decomposition of the tobacco refuse. The quantities of manures to be applied were calculated on the basis of the composition of the tobacco refuse and on that of the quantity of pigs' dung usually employed. The composition of these two manures is shown by the following table (next page).

Tobacco refuse thus contains less phosphoric acid than the dried pigs' dung, but more organic matter, nitrogen and potash.

The year 1912 did not prove very favourable to the vine, so that the result of the experiments was not so favourable as was expected.

TABLE I

	Water per cent.	Organic matter per cent.	Nitrogen per cent.	Phosphoric acid per cent.	Potash per cent.
Tobacco refuse	10	60	2.3	0.4	2.5
Dried pigs' dung.	13	56	1.9	2.2	1.5

Nevertheless it shows that tobacco refuse is useful for the vine, especially as a source of humus ; it is particularly suitable, with a complement of phosphatic and potassic manures, for sandy soils where vegetation is vigorous.

The writer recommends the following quantities per acre per annum for four years, which are not excessive.

1st year: 6154 lbs. of tobacco refuse, 309 lbs. of superphosphate and 112 lbs. of 40 per cent. potash salts.

2nd year: no manure.

3rd year: 243 lbs. of superphosphate, 112 lbs. of 40 per cent. potash salts and 93 lbs. of sulphate of ammonia.

4th year: 61 lbs. of sulphate of ammonia.

The writer is of opinion that in cases when farmyard manure is scarce, tobacco refuse, owing to its high content in organic matter and to its even action, is one of the most economical and useful manures, especially in the sandy mountain vineyards.

140 - Irrigation of Olives and Its Effects.

SOMMA, U. L'irrigazione all'olivo e sua azione. — *Le Stazioni sperimentali agrarie italiane*, Vol. XLV, Part 12, pp. 930-939. Modena, 1912.

Experiments carried out at Bari, upon old trees in full bearing, on light, permeable soil (calcareous tufa) irrigated with slightly brackish water twice, at the beginning of June and the beginning of August, by means of a basin of 10 ft. radius round the trunk of the tree, containing 135 gals. of water. Fertilizer per tree : 66 lbs. of stable manure, 2¼ lbs. of mineral superphosphate, 2¼ lbs. of sulphate of ammonia, 1 lb. of sulphate of potash.

Average per tree. From observations made during the four years 1909-1912.

Leaves and branches removed in pruning	lbs.	41.4	31.2
Olive crop	lbs.	87.8	64.5
Average weight of 1 gal. of olives		6 lbs. 5 oz.	6 lbs. 7 oz.
Olives per gallon		1668	1782
Proportion of kernels to pulp, per cent.		17.4	18.6
Percentage of water in fresh olives		42.217	41.947
Percentage of dry matter in fresh olives (at 105°C.)		57.783	58.053
Percentage of fat (ether extract) in fresh olives		23.295	22.990
Oil from 100 fresh olives	gr.	38.809	37.598

Conclusions. — 1) Irrigation promotes the development of the foliage of the tree : thus vigorous pruning is necessary. 2) The proportion between the leaves and the wood removed by pruning gives a larger percentage of leaves in the case of irrigated trees (up to 23 % compared with 18.5 % in non-irrigated). 3) Irrigation promotes a larger crop of fruit (average 21.4 lbs. per tree per annum). 4) There is less falling of the flowers, because the growth is more regular. 5) The olives are larger and heavier; their water content is a little increased, but at the same time the amount of oil present is always a little larger.

As a whole, the experiment showed that it would be most advantageous to introduce irrigation of the olive into Apulia. If fresh water were used, the results would possibly be still more satisfactory.

141 - The Uses of *Roystonea regia*.

Los Usos Economicos de la Palma Real. — *La Hacienda*, Vol. VIII, No. III, pp. 91-93 + figs. Buffalo, N. Y., December 1912.

The royal palm (*Roystonea regia* Cook) grows wild throughout the Antilles and also in South Florida, Mexico, Central America, and in the northern part of South America. It is especially abundant on damp fertile soil, such as is suitable for tobacco cultivation. In the west of Cuba it is found on land which was formerly cultivated, but has since been abandoned. The trunk is often 70 to 85 ft. high, with a diameter of at times as much as 24 inches. The wood is considered unsuitable for constructive purposes, but the external layer of hard wood is much used for walking sticks, sticks. stakes, fences, posts, tables, coffee mortars, gutters, and the partition walls of houses. The most useful portion is the "yagua," a kind of coriaceous bark. The large terminal leaves have long amplexicaul petioles 4 to 9 ft. long and as wide as the circumference of the stem. Every three or four weeks, a leaf falls ; this is damped, flattened by means of weights, and dried. The dried petioles are sold per truss and provide the best packing material for export tobacco. The leaf-bases supply a fibre from which ropes and string are made. In Cuba, "yagua" is also used in the construction of the poorest houses. The terminal bud is edible, but its removal causes the death of the tree. *R. regia* is one of the most elegant palms for planting in avenues.

142 - The Scientific Application of Fertilizers to Trees when Planted Out.

WAGNER, J. PH.: (Prof. of Agric. at Ettelbrück, Luxemburg.). Application rationnelle des Engrais aux Arbres à planter. Communication à la Société Nationale d'Agriculture de France. — *Le Progrès Agricole et Viticole*, Year 33, No. 51, pp. 793-795. Villefranche (Rhône), December 22, 1912.

The application of fertilizers to trees in general, and to young trees when they are planted out in particular, is, according to the writer, a very vexed question.

He considers the following three points :

a) The situation of the roots of the tree in the soil,
b) The nature of the young tree, its susceptibility to fungus diseases.
c) The method of action of different fertilizers.

An account is given of the following method. The chemical fertilizers (phospho-potassic) are well mixed with the superficial soil, which is to be put first of all in the trench; then comes a layer of ordinary soil 8 to 12 inches deep, next the nitrogenous fertilizer, if this is used (nitrate of soda, sulphate of ammonia, guano, etc.), and finally, the last layer of soil to fill up the trench.

The soluble nitrogen in nitrogenous fertilizers finds its way gradually to the roots; thus a nitrogenous fertilizer of a very caustic nature is no longer in direct contact with the roots where it might be harmful.

The organic manures are placed in an intermediate layer, neither too deep nor too superficial, and without being in direct contact with the roots they do not incur any risk of loss or of drying up; they are besides rendered powerless as propagators of fungus diseases.

The phosphoric acid and potash contained in less mobile artificial fertilizers are directly within reach of the roots and can be absorbed as they become capable of assimilation.

The writer adds that is is well to give the young tree for about three years, in some form or other: 25-30 gr. (about 1 oz.) of nitrogen, 30-40 gr. (1 to 1¼oz.) of phosphoric acid, 40-45 gr. (about 1½ oz.) of potash, 25-30 gr. (about 1 oz.) of lime, which about corresponds to: 7 oz. of nitrate of soda, 7 to 9 oz. of basic slag, or the corresponding weight of superphosphate, and 3 oz. of potassium chloride. If the soil is not too poor in lime, the lime contained in the slag suffices. The fertilizers, in the amounts calculated for three years, should be applied on the surface, and at the end of this time should be dug in as deep as possible, so that they may reach the roots.

143 - Forest Fires in the United States: Their Causes, Extent and Control.

1. Plummer, Fred. G.: Forest Fires: Their Causes, Extent, and Effects, with a Summary of Recorded Destruction and Loss. — *U. S. Department of Agriculture, Forest Service, Bulletin* 117, pp. 39 + figs. 6 + plate 1. Washington, 1912.

2. Peters, J. G.: Forest Fire Protection under the Weeks Law in Co-operation with States. — *U. S. Department of Agriculture, Forest Service, Circular* 205, pp. 15 + plan 1. Washington, 1912.

3. Graves, H. S.: Protection of Forests from Fires. — *U. S. Department of Agriculture, Forest Service, Bulletin* 82, pp. 48 + fig. 1 + plates X. Washington, 1912.

4. Adams, D. W.: Methods and Apparatus for the Prevention and Control of Forest Fires, as Exemplified on the Arkansas National Forests. — *U. S. Department of Agriculture, Forest Service, Bulletin* 113, pp. 27 + figs. 8 + plates VI. Washington, 1912.

5. Silcox, F. H.: Fire Prevention and Control on the National Forests. — *Yearbook of the United States Department of Agriculture*, 1910, pp. 415-424 + plates XXVII-XXXII. Washington, 1911.

1. — Forest fires in the United States have caused an average annual loss of about 70 human lives, the destruction of trees worth at the very least $25 000 000, and the loss of stock, crops, buildings, and other improvements to the amount of many millions more. To these must be added enormous losses from the destruction of young tree growth, deter-

ioration of the soil, damage to water courses and adjacent property by low water and flood, interruption of business, and depreciation of property. By an inquiry into the causes and extent of such fires we are able to realize in some degree the magnitude of these losses.

The first compilation of forest-fire statistics for the whole United States was by Prof. C. S. Sargent for 1880, published in the Tenth Census Report, Vol. IX,. In 1891 the Division of Forestry of the Department of Agriculture collected statistics of forest, prairie, and crop fires. The Chronicle Fire Tables for the year 1900 report a loss of $2 246 000 from forest fires, compiled by insurance companies. In 1900 and 1901 the Division of Forestry made a second attempt to gather statistics upon which damage from forest fires might be estimated. New data have been obtained from: (*a*) reports of fires on National Forests; (*b*) reports of State foresters from 17 States; (*c*) supplemental reports of forest supervisors of fires outside the National Forests; (*d*) reports of lumbermen's associations; (*e*) newspaper accounts from press-clipping bureaus of recent fires; (*f*) the Forest Atlas (this is the central map system of the Forest Service and contains manuscript maps); (*g*) investigations of Forest officers, particularly in even-aged forests, to determine by stem analysis the dates of old burns. Before this mass of material could be used the record of each event was reduced to a common standard, and a card system was devised, as shown below:

Sample of U. S. Forest Service fire record.

Kind of fire: Forest - Brush Land - Prairie (Check Mark Proper Term).

Location of Fire	State, ...	Date of Fire	Year, ...
	County, ...		Month, ...
	Near		Day (or Days), ...

Origin of fire, ...

Area burned, ... Timber burned, ... board feet.

Value of timber burned, ... Value of other property burned, ...

Number of buildings burned: . . . houses, . . . barns, . . . mills, and . . . others.

Number of lives lost, . . . Number stock lost: . . . cattle, . . . horses, . . . sheep.

Remarks: . . . .

The above information is furnished by . . . .

Date, ...

As the value of a fire record depends upon the field report, it is necessary that there should be a uniform method of assigning the causes of fires. The following scheme of classification in the Forest Service is recommended for general adoption as both simple and logical.

Classification of the causes of forest fires.

- Forest Fires
  - Preventable: caused by man
    - Intentional
      - *Incendiary.*
        - Maliciousness or wilful negligence.
        - Contempt for the law.
        - To cover crime.
        - To drive game.
    - Unintentional
      - Sparks or ashes from engines
        - *Railroads.*
          - Passenger, freight and work engines.
          - Steam shovels and plows.
          - Logging engines.
        - *Sawmills.*
          - Permanent mills.
          - Temporary mills.
          - Portable mills.
          - Donkey engines.
      - Generally from uncontrolled fires
        - *Brush burning.*
          - Clearing lands or rights of way.
          - Slash, rubbish, or garbage burning.
          - Stubble or meadow burning.
          - Light burning.
        - *Campers.*
          - Construction campers.
          - Recreation parties and picknickers.
          - Miners and prospectors.
          - Hunters and fishermen.
          - Stockmen, including branding and protection fires.
          - Berry pickers and nut gatherers.
          - Cruisors, surveyors, and river drivers.
          - Smokers, children, tramps, etc.
        - *Miscellaneous.*
          - Fires from burning buildings, or, from prairie or other fires, if the origin of the original fire is not known. If origin can be determined it is classified accordingly.
          - Sparks from chimneys and stacks other than those classified under "Railroads" and "Sawmills." Blasting, except as covered by the classification "Brush Burning."
          - From electric wires, unless accompanied by lightning.
          - Spontaneous combustion, either chemical or mechanical.
  - Generally unpreventable
    - *Unknown.*
      - Includes fires the cause of which is not determinable with reasonable certainty.
    - *Lightning.*

The most accurate data on the causes of forest fires are from the records kept on the National Forests.

Average per cent. of causes to total number of fires on the U. S. National Forests from 1906 *to* 1911 *inclusive.*

Railroads	26.7
Lightning	17.5
Incendiary	4.5
Brush burning	4.8
Campers	16.9
Sawmills	1.1
Unknown	20.7
Miscellaneous	7.8

A number of conditions in the forest contribute either to the inception or to the spread of fires.

Contributory forest causes	natural - litter, etc. artificial - logging refuse, etc. insects.

The climate also must be considered with other variable factors a contributory cause of fires.

Contributory climatic causes	droughts. hot seasons. hot waves. warm winds.

2. — The forest fire season of 1911 marked the first year's operation of section 2 of the Weeks law. This section authorizes the U. S. Secretary of Agriculture to co-operate with States in protecting from fire the forested watersheds (catchment basins) of navigable streams.

The States which received Federal aid under Weeks law in 1911 were 11, and the total amounts expended by them and by the Government were as follows:

		$
States Expenditure		101 209 74
Federal ,,		38 793.55
Allotment to States		45 600.00
Unexpended	Balance of allotment	6 806.45
	,, ,, $200 000 fund Jan. 1, 1912	161 206.45

There are reported many practical results of the work done under the Weeks law. Hundreds of fires left by campers, fishermen and hunters, or set by careless smokers and by locomotives, were discovered by patrolmen and promptly extinguished. Great progress was made on permanent improvements that will simplify future fire control and prevention. But in addition to these tangible results, which have been apparent from the start, the educational value of the work, although not measurable, has been far-reaching. Except in a few States, 1911 was the first year when any systematic State patrol of the forest was conducted; it marked the general extension of the State organization co-operating with the Federal Government. The most effective work of the patrolmen was in warning persons met in the woods of the danger of setting fires, and informing them of the fire laws.

3, 4, and 5. — The U. S. Forest Service has made various publications on forest fires prevention and control. The following are the chief points as set down by the Chief Forester, H. S. Graves,

For the successful protection of a forest from fire there are necessary:

a) the elimination, so far as possible, of the causes of fires;
b) a proper organization of the forest, including the disposal of slash, the opening of roads, the construction of trails, etc.;
c) an adequate supervision;
d) facilities for fighting fires.

As to the principles of fighting forest fires, they are recognized essentially as those of fighting fires in cities. The following are of first importance:

a) quick arrival at the fire;
b) an adequate force;
c) proper equipment;
d) a thorough organization of the fighting crew;
e) skill in attacking and fighting fires.

LIVE STOCK AND BREEDING.

HYGIENE

144 - Warble Flies.

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II. *Distribution* and *Life History*. — The Ox Warbles or Bots (*Hypoderma bovis* Geer and *Hypoderma lineata* Villers) belong to the Diptera, family Oestridæ. Both are found in Europe. According to Railliet (Bibl. 1) (1) *H. bovis* is found also in Asia and Africa. Up to now only *H. lineata* has been met with in North America. According to a communication from the Government of the Commonwealth of Australia, that continent is free from warble flies. On imported cattle in some cases warbles were observed, but the animals were quarantined and the larvæ destroyed.

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(1) The numbers refer to the corresponding numbers of the Bibliography.

An official of the United States Bureau of Animal Industry observed that the female of *H. lineata* deposited its eggs, about 1 mm. in length, by means of a blunt ovipositor on the hair of the cattle, most frequently preferring the hair of the forelegs. As many as six eggs have been found on one hair. Every egg has an appendage, which adheres to the hair. The eggs contain fully developed young larvæ. Egg-laying takes place during the warmest part of the year.

Cooper Curtice (Bibl. 1) found in 1890 young larvæ of *H. lineata* in the throat of cattle, and it is probable that the eggs are licked off by the animals and thus find their way into the cavity of the mouth, where the larvæ hatch out. They migrate thence into the muscular tissue of the gullet and moult after some time. Later, in the winter months, warble larvæ are found in the adipose tissue of the spinal cavity and towards spring they appear under the skin. Here they moult twice, producing abcesses. They bore an aperture through the skin, which at first serves for the introduction of air; then, when they have completed the bot or maggot stage, as a passage by which they leave their host.

They then fall to the ground on which, or just under the surface, they turn to pupæ and emerge, after from three to six weeks, as perfect sexually mature flies.

In the Southern States of the United States the first warble flies appear in the spring (Bibl. 28); in Europe their appearance is limited to the summer months from June to August. The fully developed warble fly has only rudimentary mouth parts; it consequently takes no food and lives but a short time.

What has been said of *H. lineata* holds good for *H. bovis*, with the exception that until lately no investigator had been able to ascertain whether this oestrid also laid its eggs on the hair of cattle and which part of the animal it preferred. In the summer of 1912, Gläser (Bibl. 18), however, was enabled to observe an unfecundated female of *H. bovis* laying eggs. He set the fly on the back of a bull, and saw after some time that this fly drove its ovipositor into the coat of the animal. He then found, on a spot about half a square centimetre in extent, eight eggs, and on another, about one square centimetre, upon which the fly had also stopped, six eggs adhering to the hair on the back of the bull, and rather close to the skin. The eggs were visible only when the hair was rubbed the wrong way. According to this observation it is very probable that under natural conditions normally developed and fecundated females of *H. bovis* lay their eggs on the coats of cattle and, like *H. lineata*, attach them to the hairs. In support of this view is the fact that the eggs of both species are provided with an appendage which serves for fastening the eggs to the hair. Carpenter (Bibl. 5) supposes that *H. bovis* also lays its eggs by preference on the hair of the feet, because he observed that in Ireland warble flies swarmed especially round the feet of animals.

Opinions are still divided as to how the larvæ of *H. bovis* find their way into the body of the cattle. Hinrichsen had (according to Railliet) already in 1884 discovered larvæ of these flies in the throats of cattle. Peter (Bibl. 14) examined, during 1910 and 1911, in the Hamburg slaughter house, the gullets of 9326 head of cattle and found 2013 of them containing Hypoderma larvæ. In April the affected gullets were 9.29 per cent., in May 1.75 per cent., from December to February from 28.39 to 32.42 per cent. Other investigators have found larvæ in the midriff, in the spinal cavity and in the muscular tissue under the skin. Nevertheless Stub (Bibl. 2) sets up the theory that the larvæ found in the throat do not attain full development, but perish in the body of the animal. According to him the larvæ of *H. bovis* can only develop normally when they have bored a passage through the skin from the outside. He found, on examining the hides of slaughtered animals, minute passages which went right through the hide, each of them containing at its inner extremity a young warble larva in the first stage of development (after the first moult). Several of these passages from the outside reached only to about the middle of the hide. Gläser (Bibl. 18), on the other hand, asserts on the strength of his observations that passages are to be found which, starting from the inside, do not go right through the hide. He admits the existence of fine passages through the hide, but says that Stub carried out his observations in March, namely at a time when possibly all the larvæ have already bored through from the inside to the outside. Peter (Bibl. 13) is of opinion that the larvæ enter the animal by the gullet, bore through the hide from the inside as far as the roots of the hairs, and from this point to the outside the opening is completed indirectly by inflammatory processes. In support of this view Peter in his paper gives several figures showing cross sections and a longitudinal section of such passages.

Carpenter (Bibl. 5, 6, 7) has been conducting experiments for some years past in Ireland, with the object of ascertaining how *Hypoderma* larvæ enter the bodies of cattle. He kept during the years 1904 and 1905 four calves always covered with a cloth together with other calves on a pasture; in the summer of 1905 four other calves were provided with coverings for their limbs also, and further six calves completely covered were kept on the pasture. Of these only one lived to the next spring. The average number of warbles found on the calves protected by clothing differed very little from that found on the unprotected animals. Only the completely clothed surviving calf was found in spring to be quite free from the larvæ. (At the last counting of the larvæ in May it was not possible to ascertain with certainty which of the calves had been completely clothed during the preceding year).

In the summers of 1906, 1907, 1908 and 1909 Carpenter provided several calves with leather muzzles and kept them with other calves on a pasture. The muzzles were to prevent the calves from licking themselves and thus affording warble larvæ or their eggs the means of passing through the calves' mouths into their bodies. During the night and whilst feeding their necks were fastened in such a manner to a kind of wooden frame that the animals could not lick themselves, besides which, the fore-legs were clothed. Nevertheless, in the spring of 1907 five of these muzzled calves had 10 to 27 warble larvæ on them; only one was completely free. Two calves which had worn muzzles in 1907 bore no warbles in 1908. In the summer of 1908 other six calves were kept muzzled on the pasture. Instead of clothing their forelegs, a kind of apron formed by a sack was hung round the animals' necks to prevent them from licking their forelegs. The above-mentioned wooden frame was also used. In spite of these measures, in the following spring all the protected calves had an average of 4.66 warbles, against an average of 4.33 warbles on the nine unmuzzled control calves. In the summer of 1909 five muzzled calves were kept on the pasture. Over the leather muzzle a large wire one was placed so as to prevent the calves taking up larvæ through the openings in the leather muzzle. The other precautions were the same as had been previously taken. Together with these five calves fifteen control calves were sent into the same pasture. Each of these latter calves had in the spring of 1910 an average of 6.33 warbles. Three of the muzzled calves had only one warble each, one had three and one had four. Carpenter adds that by means of the double muzzle at least a partial protection against the larvæ was obtained. The results would probably have been better if the wire muzzles had been immediately used with the leather ones. But the former arrived only at the end of May, so that the calves were protected during the very warm last week in May only by the leather muzzles. — Carpenter is continuing his experiments.

III. *Kind and extent of injury caused by warble flies.* — There can be no doubt that warble flies injure cattle in various ways. In the first place their presence disturbs grazing cattle. In the Pedernales river valley in North America it has been observed that out of fear of warble flies the herds leave off grazing during the warm hours of the summer days and seek refuge in the river.

The injury that the animals suffer from the larvæ can consist in lower milk yield and in the depreciation of their flesh and hides. The loss in milk is valued by some as high as 20 per cent., but this estimation cannot be accurately checked.

The injury to the flesh consists in the inflammatory modifications it undergoes in consequence of the presence of the larvæ; the inflammation is revealed by the effusion of serum in the connective tissue and renders the meat unsightly; so called "licked beef."

The most mischief is that done to hides. Krause (Bibl. 17) has endeavoured to ascertain the extent of this damage in Germany. He sent a question sheet to all the largest tanneries requesting them to answer the questions referring to warbles in hides. About 50 works gave the desired information, with the aid of which, together with the statistics of the animals slaughtered in 1910, Krause calculated that in that year about 24 per cent. of all the hides in Germany were damaged by warbles: 31.03 per cent. in North Germany and 9.08 per cent. in South Germany. The total number of damaged skins amounted to 941 994. Assuming the depreciation in North Germany to be 3*s.* 9 $^{3}/_{4}$ *d.* and in South Germany 3*s.* 6 $^{3}/_{4}$ *d.* per hide, the total loss in Germany in 1910 was £178 142 8*s.*

The English Board of Agriculture (Bibl. 12) was informed by a tannery that out of 132 000 hides which had been worked, 40 000 were damaged by warbles. In another tannery only 1500 hides out of 20 000 were damaged. The depreciation amounted to from 2*s.* 6*d.* to 5*s.*

Gayets and Vaney (Bibl. 4) state that in Forez (Dep. de la Loire, France) on examining some herds, warbles were found on 4 per cent. of the cattle aged three years and upwards and on 52 per cent. of the one and two-year olds.

Rasquin (Bibl. 23) found that in several Belgian slaughterhouses 3.5 to 13 per cent. of the hides were damaged by warbles. He calculated the total number of damaged hides in Belgium to be 48 720 per year. The depreciation per skin is valued at 2*s.* 1 $^{3}/_{4}$ *d.*

According to De Vries (Bibl. 19) from 30 to 33 per cent. of the cattle of Holland are affected by warbles.

From the United States no recent figures are available. In the year 1889 an agricultural paper (Bibl. 1, 28) stated that from January to July about 50 per cent. of the cattle delivered at the Union Stock Yards in Chicago had warbles.

In Canada (Bibl. 29, 30) warble infection is especially considerable in the provinces of Manitoba, Saskatchewan and Alberta. It is customary to reduce the purchase price by two dollars for every head of cattle found suffering from warbles.

IV. *The destruction of warble flies* has not hitherto been rendered compulsory by legislation in any country except the German State of Oldenburg (Bibl. 17), in which a ministerial decree of March 11, 1910, orders that in the district of the Wesermarsch Herdbook Association the destruction of warbles is to be carried out. The Chamber of Agriculture of Oldenburg sent, in the years 1910 and 1911, a circular to the agricultural and milk control associations, enquiring as to the success which up to then had attended the destruction of the pest. In both years ten reports announce total or partial success; 6 reports do not communicate any success; 9 reports state that a conclusive opinion cannot be formed owing to the shortness of time during which the work had been going on. With few exceptions all the reports conclude in favour of continuing the experiment and demand that the compulsory destruction of warbles be extended to the whole Duchy of Oldenburg.

Denmark was the first country in which attempts were made to control warble flies by private initiative. The Skjaerum Dairying Co-operative Association began the campaign against warbles in 1902, and has carried it on since then (Bibl. 17). A specially trained staff examines the herds a fortnight before they are sent out to graze. The larvæ are removed by a steel instrument. Immediately before being sent to the pasture and several times in the course of the summer the animals are again examined and the larvæ removed.

The following table gives data on the cost of the work and on the results obtained.

Year	Stock	Head of Cattle	Number of Larvae	Cost per head of cattle
				d
1906	Old stock	3 756	4 016	0.458
	Cattle bought	286	4 980	
1907	Old stock	3 810	7 100	0.526
	Cattle bought	439	5 855	
1908	Old stock	4 076	1 123	0.392
	Cattle bought	186	2 448	
1909	Old stock	3 614	1 116	0.433
	Cattle bought	261	3 926	
1910	Old stock	3 348	369	0.352
	Cattle bought	209	3 506	

In Ireland, Carpenter (Bibl. 5, 6, 7) began in 1907 the destruction of warbles at the Agricultural Experiment Station of Ballyhaise. The average number of warbles per head of cattle in the herd sank from 10.77 in 1907 to 4.44 in 1908. In 1908 there were still 132 head of cattle which had been on the farm since the preceding summer. In 1909 the average number of warbles per head was 7.7 and in 1910, 7.52. It is worthy of note that all the animals that grazed always in the centre of the farm bore on average a much smaller number of warbles than those which were constantly kept on the outer fields.

The same observation was made, according to Boas (Bibl. 27) on the Danish estate Gaardbogaard in which warble destruction was practised.

In Germany a "Committee for the extermination of the warble pest" was formed in 1910. This Committee publishes a periodical and supports the scientific investigation on the life history of the warble fly. At the exhibitions of the German Agricultural Association (Deutsche Landwirtschafts-Gesellschaft) in Hamburg in 1910 and at Cassel in 1911 there were special exhibits showing leather with warble holes, skins with fresh abscesses and warble larvæ in their various stages of development.

In the Municipal Bureau of Public Health in Berlin a volunteer assistant for the investigation of the life history of warble flies has been appointed. For the defrayal of the expense, the Imperial Ministry of the Interior has contributed up to now about £ 200, several representative of the leather industry about £ 250 and other groups of people interested in the question about £ 150.

In France the French association for the destruction of warble flies was founded in November 1910, provisionally for 10 years. The members pay subscriptions of from 16 *s.* to £ 20. The association publishes a periodical containing papers on warble flies. In No. 2 of the above periodical there is an article intended as a guide for elementary school teachers in their lessons on warble flies.

The association has provided the veterinary school at Alfort and the school of tannery in Lyons with a steer affected with warbles to be used for investigations. It has further induced the horse gelders (Hongreurs) of the Department of Allier to undertake the campaign against warbles at the rate of 1*s.* 8*d.* per 100 larvæ. It appears also that school children receive a reward, somewhat higher than the above, for the larvæ they deliver. The association has also addressed a circular to the directors of agricultural schools, to the teachers of agriculture and to the departmental veterinary surgeons begging them to give assistance to the work of destroying warble flies. At the request of the Association the Minister of Agriculture has appointed an official for the investigation of the life history of the warble fly and has granted the Association a contribution of about £ 40.

In Sweden in the elementary schools instruction is frequently given on the warble fly and its destruction. It is believed that in consequence of this teaching the pest has somewhat abated.

The Ministries of Great Britain, Belgium, Switzerland, Austria, the United States and Canada have hitherto limited their action to instructing farmers by means of publications on warble flies.

From Russia, Norway, Holland, Italy and Hungary there are only private publications on the subject. In Hungary, however, the Council of Hygiene of Live Stock dealt with the pest in 1911.

The introduction of warble flies in Australia should be prevented by the Commonwealth Quarantine Act. The State entomologist for Queensland has proposed to the Australian Government to render this Act more stringent in respect of cattle affected by warbles. The Government will take an amendment of the quarahtine measures into consideration.

145 - Anaplasmosis in Cattle (1).

La tristeza en los bovines. Una nueva forma del mal. — *Revista de la Asociación Rural del Uruguay*, Year XLI, No. 9, pp. 684-686. Montevideo, 1912.

An extract from the account furnished by Dr. Lignières, Director of the Bacteriological Institute, and Chief of the Cattle Breeding Division of the Ministry of Agriculture of the Republic of Argentina.

Dr. Lignières showed some time ago, that inoculation with *Piroplasma bigeminum* did not confer immunity from *P. argentinum*, and that in spite of successive transmissions during a period of some months, the two parasites retained their own special characteristics. Similar statements are made in South Africa and elsewhere: thus the individuality of these two causes of pyroplasmosis has been established.

From the end of 1911 until April 1912, Dr. Lignières had occasion to study several abnormal outbreaks of gall-sickness ("tristeza") both in inoculated cattle and in creol cattle, which are naturally immune. On reproducing the disease in the laboratory by means of the blood of infected animals, he obtained a new form of "tristeza," caused by a hæmatozoon different from those hitherto found in Argentina.

Under natural conditions, the new disease usually does not occur alone, but is generally accompanied by *P. bigeminum*, and sometimes by *P. argentinum*. It appears as a chronic affection, with high, sometimes intermittent, fever, severe anæmia, great debility and diminution or entire loss of appetite.

The examination of the blood of infected animals at the time when the disease was at its height, revealed a relatively large number of parasites in globules stained by the Laveron or Giemsa methods. These parasites were completely spherical, deeply and uniformly stained; they generally occurred only in one or two globules and were situated near the periphery of the latter. The parasite is certainly an *Anaplasma*, and the studies being prosecuted by the writer will show whether or not it is identical with *A. marginale* Theiler.

Dr. Guth has observed coccus forms in Uruguay, which are probably to be referred to anaplasmosis; the latter disease was carefully studied at Sao Paulo by Dr. A. Carimi, Director of the Pasteur Institute at that place. In North America the existence of anaplasmosis has so far not been definitely proved, though it probably occurs there, since Messrs. Smith and Kilbern describe in their first publications dealing with Texas fever, coccus forms, which are situated at the periphery of the globules.

Dr. Lignières was able to produce anaplasmosis by means of the blood or organs of diseased animals, and by the agency of *Margaropus microplus* (the tick which spreads *Piroplasma bigeminum* and *P. argentinum*) obtained from infected cattle. Anaplasmosis is a far more serious disease than piroplasmosis; most of the infected cattle die, sometimes after resisting the malady for some weeks or months.

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(1) See No. 810, *B.* May 1912 and Nos. 42 and 43, *B.* Jan. 1913. (*Ed.*).

Inoculation against *Piroplasma bigeminum* and *P. argentinum* is of little effect against *Anaplasma.*

Dr. Lignières insists on the necessity of adopting special sanitary measures to prevent the spread of anaplasmosis, which seems only to exist in Argentina in limited areas in the north of the country.

146 - A Study of the Normal Blood of Carabao.

ANATOMY AND PHYSIOLOGY

BOYNTON, WILLIAM HUTCHINS: in *Philippine Islands Department of Public Instruction, Bureau of Agriculture, Bulletin* No. 21. Manila, 1912.

The writer used for his researches 25 buffaloes from 2½ to 6 years old. Some of them were draught animals that had been immunized against rinderpest. The greater portion of the other animals had not been immunized.

The body temperature of the animals experimented upon was taken daily for several weeks before the examination of the blood began. The blood to be examined was always taken from a vein of the ear, after the ear had been well cleansed and dried with alcohol.

A short description is given of the methods followed in the investigations, as well as several tables of the results, which may be summarized as follows:

1) In the circulating blood of apparently normal buffaloes upwards of two years of age, an average of 6 057 520 red blood corpuscles were found per cubic millimetre of blood.

2) The average content of haemoglobin was 92.6 per cent.

3) In every cubic millimetre of blood there were on average 10 389 leucocytes.

4) The average specific gravity was 1.0532.

5) The ratio of the blood corpuscles to the plasma was 29.1 to 70.9.

6) The time necessary for the complete coagulation of the blood was 3 minutes 16 seconds.

7) The following five kinds of leucocytes were found:

a) Lymphocytes; average diameter 7.3 µ; average number per cubic millimetre: 5049, or 48.5 per cent. of all the leuocytes.

b) Large single nucleus leucocytes; average diameter 10.8 µ; average number per cubic millimetre: 484, or 4.6 per cent. of all the leucocytes.

c) Polynuclear leucocytes; average diameter 9.4 µ; average number per cubic milimetre: 3598, or 34.5 per cent of all the leucocytes.

d) Eosinophil leucocytes; average diameter 10,9 µ; average number per cubic millimetre: 1142, or 11.5 per cent. of all the leucocytes.

e) Mastzellen; average diamter 7.8 µ; average number per cubic millimetre: 115, or 1.2 per cent. of all leucocytes.

FEEDS AND FEEDING

147 - Use of "Vindobona Pulp" on a Large Scale for the Ensilage of Sugar Beet Pulps, in Hungary.

KOPPELY, GEZA.: A "Vindobona pulpe" nagybani alkalmazása répaszelet bevermelésénél. — *Mezőgazdák*, Year XIX, No. 21, p. 177. Budapest, November 1912.

Three years ago the writer introduced Bouillant's "Lacto Pulp" into the farms belonging to the Hatvan sugar factory and employed it with success for the better preservation of the ensilaged beet pulps. M. Heggi, Chief of the Station of Plant Physiology and Pathology at Magyaróvár, was then occupied with the question, and described the good results of his experiments of pure cultures in milk serum for the preservation of ensilaged pulps. This encouraged the Halvan sugar factory to use on a greater scale the "Lacto pulp" imported from France.

The favourable results of the first year's experiments induced the writer to inform the agricultural public of the use of the pure cultures in milk serum and to call the attention of the sugar factories to them. He has since adopted the "Vindobona pulp" prepared at the Moser laboratory in Vienna, which is also a pure culture in serum, legally guaranteed(1), and he reports briefly upon the results he obtained in 1911 with the ensilage of 1300 railway car loads of fresh pulp, on which "Vindobona pulp" was sprayed whilst being put into the silo. This treatment diminished by about one quarter the loss of weight due to excess of fermentation which in previous years had attained to 34 per cent. It also improved the quality of the pulp, which was more relished by the live stock than the untreated pulp.

In order to compare the loss in weight between the treated and the untreated ensilaged pulp the writer, assisted by M. Arthur Zaitschek, chief chemist of the Royal Station of Biology and Stock-feeding, conducted the following experiment:

On November 24, 1911, two silos were filled: one containing 1634 cwt. of well pressed pulp treated with "Vindobona pulp", the other 1649 cwt. of pulp equally well pressed but not treated. On July 20, 1912, the first silo yielded 1247 cwt. and the second 1107 cwt. of pulp. Consequently the loss of pulp in the first was 388 cwt., or 23.8 per cent., and in the second 542 cwt., or 32.9 per cent. The loss of weight in this experiment was thus the same as that previously observed by the writer, who warmly recommends all farmers to use the "Vindobona pulp" treatment.

BREEDING

148 - Some Data on the Inheritance of Horns in Sheep.

ARKELL, T. R.: *New Hampshire Agricultural Experiment Station, Department of Animal Husbandry, Bulletin* 160. Durham, N. H., May 1912.

According to Darwin, when a cross is made between horned and hornless sheep, the male offspring under certain conditions develop horns but the females are hornless.

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(1) For details of the "Vindobona pulp" treatment see M. BUSITS-JOSZSEF's article in *Köztelek*, Year 22, No. 95, pp. 3252-3253.

Wood found that the F_1 generation arising from the mating of horned and hornless sheep, by breeding *inter se* produced about 75 per cent. horned and 25 per cent. hornless males, while among the female offspring of the F_1 generation 75 per cent. were hornless and 25 per cent. were horned.

The writer states that Darwin's and Wood's data do not correspond exactly to reality, for sheep according to the condition of the horns they bear may be divided into three categories :

1) Breeds with both males and females heavily horned (as the Dorset Horn and Lonk).

2) Breeds with the males only horned (Merino class ; frequently hornless males are found, and at times females with some signs of horn growth.).

3) Breeds with both sexes hornless (Downs and many coarse-wooled sheep, the most prominent of which are Lincoln, Cotswold and Leicester).

The writer has discovered by actual measurements that little appreciable variation exists in the size of the horns of Dorsets under similar conditions of feed and care. This, however, does not hold true for Merino sheep. They are most variable even within the same breed or strain. Some males carry heavy, others short light horns, and in many breeds they are hornless. All authorities on sheep concur that Merino ewes are hornless, yet many practical Merino sheep raisers have admitted to the writer that a mere scab, or very short loose scur, may appear every now and again from the horn pits of some Merino ewes. The writer himself found at times a short hard knob protruding from the horn pits of Merino ewes. In 53 out of 128 American Merino ewes he found these knobs or excrescences, and 5 of these had besides scabs or short scurs.

Castration seems to have a decided influence on the development of horns. This question, however, needs further investigation.

The writer has (in *Science*, N. S., Vol. XXV, No. 897) together with Davenport, and combining the results of other investigators with those of their own breeding tests, formulated the hypothesis that horns in sheep represented a typical sex-limited character. According to this hypothesis there is an inhibitor in the sex chromosome which weakens or neutralizes the horn determiner ; the hypothesis assumes further that the male sex in sheep is heterozygous (simplex), it possesses only one sex chromosome, while the female sex has two, and is homozygous (duplex). The inhibitor for horn formation will at times be double in female sheep and single in the male. Further the determiners for horn formation are not equally strong in all breeds of sheep. The writer distinguishes in this respect a vigorous determiner H (Dorset Horn type) and a weaker determiner H_1 (Rambouillet type). The absence of the horn determiner is represented by h. In the zygote the single inhibitor is incapable of preventing the development of horn when this zygote has two determiners (HH or H_1H_1) or one (Hh or H_1h). In the latter case, however, the formation of horn is much reduced. Males with one horn determiner are lightly horned, those with two heavily horned. Only the double inhibitor occurring in the female zygote is capable of suppressing completely the development of horn when there is only one determiner (Hh or H1h); it cannot suppress it when it contains two determiners (HH). If there are two weak determiners (H1H1) the above mentioned excrescences or knobs, scabs or scurs in the horn pits arise. When the determiners (H or H1) for the formation of horn are lacking, no horns appear.

For his breeding experiments the writer used Dorset Horns, Merinos and South Downs, altogether 113 individuals. As common standard for the study of horns the ratio of circumference to length was taken. The length of the horn was measured from the poll to the tip of the horn, once on the inside and once on the outside. An average between the two gives the length of the horn. The circumference is taken as close to the poll as possible.

The tables appended contain all the combinations of determiners theoretically possible with the matings made. Further tables give information on the crosses obtained and on the resulting F1 and F2 generations.

The results of the crosses can be well explained by the theory of the writer. He however does not consider the problem of the inheritance of horns in sheep as one finally solved; he hopes soon to be able to contribute further material towards its solution.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

149 – Stock Census in Hungary for the Periods 1895-1911 and 1911-12.

KOMAROMI, SANDOR. Haszonállataink. — *Politikai Hetiszemle*, Year XIX, No. 52, pp. 7-9. Budapest, December 29, 1912.

The Royal Hungarian Minister of Agriculture has just published a report of the stock census taken in the spring of 1912. The only satisfactory fact to be noted is an increase in the total number of pigs. The other animals continue decreasing, as is shown by the following table.

	Total in 1895	Per 1000 inhabitants	Total in 1911	Per 1000 inhabitants	Total in 1912	Per 1000 inhabitants
Cattle	5 829 585	365.2	6 185 264	338.6	6 036 945	325.3
Horses.	1 997 098	125.1	2 001 431	109.6	1 960 000	105.6
Mules and donkeys .	22 281	1.4	18 769	1.0	16 954	0.9
Goats	286 392	17.9	331 383	18.1	313 839	16.9
Pigs	6 447 370	403.9	6 416 424	351.3	7 409 801	399.1
Sheep	7 526 784	471.5	2 697 719	421.5	7 168 054	386.2

The increases (+) and decreases (—) are as follows :

	1895-1911		1911-1912	
	On the total number	Per 1 000 inhabitants	On the total number	Per 1 000 inhabitants
Cattle	+ 354 679	— 26.6	— 147 319	— 13.3
Horses	+ 4 333	— 15.6	— 41 431	— 4.0
Mules and donkeys	— 3 512	— 0.4	— 1 815	— 0.1
Goats	+ 44 991	+ 0.2	— 17 534	— 1.2
Pigs	— 30 946	— 52.5	+ 993 377	+ 47.9
Sheep	+ 170 935	— 50.0	— 529 665	— 35.3

From 1895 to 1911, the total number increased, except in the case of pigs, mules and donkeys. From 1911 to 1912, the pigs alone increased.

Independently of the more or less correct statistical data it may be stated that, up to the present, the industry of cattle breeding as a whole has not shown signs of a capacity for improvement. A fresh proof of this is afforded by the stock census of 1912. The Ministry of Agriculture has made every possible effort to change the situation, but so far, pig-breeding alone has shown favourable results, while an improvement in cattle breeding will only follow the accomplishment of the measures taken for extending and improving the pastures, distributing breeding animals at reduced prices and avoiding the loss occasioned by foot-and-mouth disease and other contagious diseases.

The total number of cattle in Hungary is not sufficient to meet the large demand for milk, meat and exportation. Not only is the number of cows in this country less than that in France (52 per cent. of the whole number of cattle), in Germany (53 per cent.), in Italy (55 per cent.), in Denmark (57 per cent.), in Sweden (58 per cent.) and in Argentina (51.5 per cent.), but it does not even remain stationary, having decreased from 44.4 per cent. in 1911 to 44.2 per cent. in 1912. On the other hand only 1 183 921 cattle were slaughtered in 1911, a reduction of 288 683 head, or about 20 per cent., on 1910. Finally, in 1911, 254 956 cattle were exported, or 167 351 (39 per cent.) less than in 1910. The total number of cattle for the butcher and for the export trade should have increased in 1911 by 458 034, or 7.4 per cent., which ought to have been shown by the stock census of 1912, while, on the contrary, the total in 1912 was lower than that of 1911.

In short, the live stock reared in no way satisfy the requirements of the country.

150 - Live Stock Breeding in the Province of Entre Rios, Argentina.

1. La ganaderia en Entre Rios. — *Gaceta Rural, Mercantil e Industrial*, Year VI, No. 63, pp. 223-227. Buenos Ayres, October 1912.
2. The Province of Entre Rios in 1911. — *The Review of the River Plate*, Vol. XXXVIII, No. 1092, p. 1138. Buenos Ayres, November 1, 1912.

The Province of Entre Rios, with its slightly undulating surface traversed by the numerous, and to a great extent navigable, tributaries of the Paranà and Uruguay Rivers, is eminently adapted to live stock raising, owing to its topographic and climatic conditions, to the extent of its pastures and the good quality of its spontaneous grasses. Agriculture also, favoured as it is by the natural fertility of the soil, is in constant progress. In 1911, 1 985 732 acres were cultivated ; of these :

722 529 acres were under	wheat
880 747 ,, ,, ,,	flax (for the seed)
103 605 ,, ,, ,,	maize
210 772 ,, ,, ,,	oats
40 456 ,, ,, ,,	lucerne

Nevertheless the principal wealth of Entre Rios consists of live stock, to the rearing of which 14 374 106 acres (out of the total surface of 18 711 238 acres) were devoted in 1911. The numbers of animals in that year were the following:

2 226 352	cattle
534 114	horses
17 845	asses and mules
6 720 487	sheep
23 238	goats
36 961	pigs

The above figures, if compared with the returns of the " Censimento Agro-Pecuario " of 1908, show a falling off, due to the consecutive droughts of 1909 and 1910.

Among the various breeds of cattle, Shorthorns are preferred, on account of their precocity and of the excellent results attendant upon their use in the improvement of the native (" criollo ") cattle ; nevertheless in some parts of the centre and north they are losing ground and are being replaced by Polled Angus and Herefords, which are hardier (especially as regards resistance to anthrax and " tristeza " or redwater) and stand the summer heat better, besides being less exacting in their requirements.

Among the sheep, the Romney Marsh breed holds the first place. After many tests extending over several years it has given origin to a variety which is an excellent producer of meat and wool, and valuable in the improvement of other breeds, enabling it to compete with the famous and widely spread Lincoln breed. In the northern districts the black-faced Shropshire Downs are much esteemed.

Among horses, Hackneys, Anglo-Normans and English race-horses are bred, and in the Montiel district the ancient "criollo" horse, of which thorough-breds exist, is bred.

Among pigs, Yorkshires and Berkshires predominate.

The principal products of the above animals (excluding horses) are meat, or meat and wool. The dairying industry is of quite recent growth and is still unimportant. The exports consist either of living animals (to Brazil and Uruguay) or of salt meat. There are in the province six "saladeros," which in 1911 dealt with 353 075 head of cattle, 586 young horses and 9 449 sheep.

The crossing of the native breeds has only recently been commenced; it has, however, already given excellent results. It is chiefly practised in the departments of Gualeguaychu, Gualeguay and Victoria, and in a great part of those of Concordia and Uruguay, as this region is immune from ticks, which allows of Durhams being introduced.

The agricultural associations and the prize competitions that they have held, have contributed a good deal to the improvement in live stock breeding and rearing.

151 – The Encouragement of Horse-Breeding in Brazil.

Criaçao do cavallo nacional. — *A Evoluçao agricola,* Year IV, No. XL, pp. 18-19. Sao Paulo, October 1912.

The National Congress of Brazil, after having determined the conditions which entitle horse-breeding societies to receive Government subsidies, have decided to appoint an official Stud Book Commission presided over by the Minister of Agriculture and entrusted with: instituting and keeping an official studbook for thorough-breds; issuing certificates; examining the certificates and documents of animals which are to be entered; keeping registers of the latter; establishing the identity of such animals, and deciding *ex officio* all questions respecting them.

All imported thorough-breds are to be entered in the Studbook. It is obligatory that all thorough-breds born in Brazil should also be entered, if they are to enjoy the privileges granted by this law. Racing Societies are obliged, under penalty of forfeiting the subsidies of the Federal Government, to organize, at all their race-meetings, competitions for home-bred animals of 2, 3, 4 or more, years of age, from April to June, and for animals of 3, 4 or more years of age, from July to the end of the racing season. Further, they must offer for the above-mentioned horses, in the federal capital, three annual prizes ("grands prix") of not less than 5000 milreis (about £312) in value. The breeders of the winners will receive 5 % of the sum of the first prize. Only horses entered in the studbook will be allowed to compete; the programme will be examined by the Studbook Commission. The racing societies which conform to the provisions of this law will receive from the Federal Government a subsidy of 15000 milreis (about £940), and are exempt from the payment of any federal taxes.

HORSES, ASSES AND MULES

152 - The Breeding of Mules for the Market in Missouri.

CHANEY, WALTER S. — Market Mules in the Making. - *The Breeder's Gazette*, Vol. LXII, No. 25 (1621), pp. 1362 and 1366a. Chicago, December 18, 1912.

The mules foaled in the spring in the mule-breeding districts of Missouri run with their mothers on bluegrass (1) pasture till weaning time in autumn; and during this time they get nothing besides mare's milk and grass. They are generally sold in autumn to traders, at prices ranging from $ 50 to $ 125 (£ 10 5 s to £ 25 15s) ; the trader divides them into lots, selling the best forthwith, while the others are put onto bluegrass again, often getting the run of corn (maize) stalk land also.

Only the better quality ones get some corn, oats and hay besides the bluegrass and corn leaves. They are generally left out all winter. They put on thick, shaggy coats in autumn. They are kept on bluegrass through the next summer, and wintered on this and corn stalk land.

As two-year-olds the mules are bought mostly by small farmers, who break them and work them for the season ; of the price of a pair ($ 400 to $ 500, i. e. £ 80 to £ 100), the trader gets only a small part, the rest being secured by a promissory note for twelve months at 8 per cent. interest, with a mortgage on the animals ; this note he may sell to a bank if he requires the money.

As three-year-olds, the mules are bought by dealers, who fatten them up before selling them in lots of twenty or more at Kansas City or St. Louis. There they are divided into several classes: sugar mules, cotton mules, miners, railroad mules, logging and turpentine mules, and others.

The sugar mules must show great quality, being thoroughly well bred ; they are 3 to 6 years old, and 16 hands or more in height, weighing 1175 to 1350 lbs.; they must have fine heads, sleak coats, clean limbs, and be without blemish ; mares are much preferred.

Cotton mules are practically like sugar mules only smaller, 14.2 to 15.2 hands high.

Miners must be short legged and as heavy as possible ; they may run from four up to ten years old ; slight blemishes do not matter, as they are for slow hard work.

The log or turpentine mule is used in the forests of the south-eastern States ; size is the great requisite ; in age they run from six to ten years.

Railroad mules are big and strong, with plenty of room behind the shoulders ; horse and mare mules are of equal value for this purpose and a few slight blemishes do not hurt their value.

CATTLE

153 - The Supply of Agricultural Cattle in India.

LOW, C. E. in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 331-342. Pusa, October 1912.

Attention has frequently been called to the diminution in the number of cattle which is said to be taking place in India.

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(1) *Poa pratensis:* known in England as smooth-stalked meadow-grass. (*Ed.*).

The writer does not consider that there are any grounds for this statement, and gives in support of his opinion, statistical information regarding the cattle of British India (not including Bengal). Although it is difficult to ensure accuracy in the enumeration of cattle in India, yet for some years past an ever increasing degree of accuracy has been secured, and according to the writer, the probable error in most parts of India does not now much exceed 5 per cent. The following table shows the total number of cattle in each of a series of selected years, also the cropped area and population throughout British India. To make this statement clearer, the figure of the initial year has, in each case, also been expressed as 100 and that of each succeeding year has been reduced to the proportionate figure.

Progressive increase in cattle, cropped area and population in British India, excluding Bengal.

(*All figures save percentages are in thousands*).

Year	1885/86	1890/91	1895/96	1900/01	1905/06	1909/10
Nett cropped area	128 283	138 265	135 487	146 708	155 452	170 862
Percentage	100	107.8	105.6	114	121	133
Total number of cattle	53 921	73 375	78 581	84 434	91 130	94 903
Percentage	100	136	145.7	156.5	169	176
Total population of nearest census year	152 141	171 926	171 926	180 890	180 890	191 599
Percentage	100	113	113	118.9	118.9	125.9

It is clear that there has been an increase in the number of cattle, this increase being more rapid than that of the cropped area. The proof of this increase is not only derived from statistics, for there is necessarily a limit to the number of acres which a pair of oxen can cultivate, and as the cropped area has been steadily rising, it follows that the number of cattle has increased.

There is also an increase in the price of cattle, owing to more grassland having been brought under cultivation and no longer serving as grazing grounds. The price of draught oxen rises with the increased demand. Cattle and fodder being alike dearer, cause a rise in the price of milk.

The breeding of cattle is carried on, partly by cultivators in their villages, partly by professional graziers in forest or other large grazing areas. In the first case, the breeding animals are ill-tended and ill-fed, and the tendency is to breed an inferior animal, whose only recommendation is that it can live on a minimum of food.

More attention has, however, been paid to cattle of late in the irrigated areas ; and stall-feeding is here on the increase. The Government has wisely divided its forest areas available for grazing into grazing units and has fixed the number of animals that can be allowed to feed there.

An increase in the number of cattle can only be expected when stall-feeding is more extensively practised under circumstances which will secure in all years an adequate supply of the necessary food. Lucerne and Egyptian clover (*Trifolium alexandrinum*), under favourable circumstances, will give a heavier yield of fodder than any other crop. Several varieties of millet give heavy yields of fodder under irrigation.

Irrigated pastures, which are already beginning to find favour, are another alternative. Oil cake, which is now usually sent to England, would be a valuable adjunct to bulky fodder.

Were it practicable to bring the whole cultivated area of India under irrigation, the question of cattle-feeding would soon be solved, but as this is out of the question, it is necessary to consider the best methods of dealing with areas where irrigation is not practicable. In such districts, millets and pulse are the main stand-by. In years of ordinary rainfall, the supply of the former is usually in excess of the demand and the surplus is habitually sold, or wasted. An efficient method of storage is required, so that the surplus stock of one year could be kept till the next and thus a continual supply of fodder would be ensured. Experiments at Berar have shown that *juari* stalks can be stored successfully for more than a year, with little or no loss.

The grass in the Government Forests could be more economically used by feeding, than by grazing, and the policy of the Central Provinces Forest Department is now " Cheap grass and dear grazing." This department is throwing open forest areas, where no effective demand for grass exists, to capitalists who are prepared to maintain a proper number of cattle of good type.

The Civil Veterinary Department has done much of late years to control the inroads of infectious disease. In the year 1910-11, 309 253 cattle were inoculated and 756 895 head were treated otherwise than by inoculation.

154 - Afrikander Cattle.

HOLM, ALEX. in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 5, pp. 687-692. Pretoria, November 1912.

The name " Afrikander " is unfortunately applied to all common or mongrel bred stock in South Africa, but there is a pure breed named " Afrikander," of ancient lineage, possessing much prepotency and quite fixed in type. The idea that this breed owes its origin to, or has been influenced in its creation by, Devon cattle imported to South Africa has been found to be incorrect, for it is proved that pure Afrikander cattle existed in the latter country at the beginning of the 19th century, before the first Devons were imported. However, it is not unlikely that there is an indirect relationship. During the sixteenth century, Portugal had considerable trade with the Cape Peninsula; later, during the régime of the East India Company in the latter part of the seventeenth century, there was a good deal of traffic between the Cape and the Indian Archipelago, and probably cattle were brought from Portugal and Java to the Cape. About the same time as Portuguese cattle were shipped to the Cape, it is also probable that they were landed on the southern shores of England and therefore that they had some influence upon the cattle bred in the counties of Devon and Somerset, from which the Devons of to-day subsequently sprang.

Although the Dutch colonists imported their black and white cattle to South Africa, the writer does not think that the latter played an important part in the creation of the Afrikander.

The Afrikander was first and foremost a "trek ox", and before the days of railways, these animals were used in transport waggons; this had a great influence on the breed, as active, strong oxen, uniform in type, colour and outline, were selected for these purposes.

The present Afrikander cattle are red, with long head, wide-spreading horns, very muscular neck, powerfully developed shoulders, slightly depresssed back, muscular hindquarters, and powerful legs, with medium-sized hoofs and even, round, deep toes. It is a hardy breed, suited to the South African climate and excellent for draught purposes. They are slow in coming to maturity ; the oxen are full-grown at from six to seven years of age and weigh 600 to 750 lbs. dressed carcass. The milk yield of the cows is low, though individual animals are fair milkers.

In the summer of 1912, an Afrikander Cattle Breeders' Society was formed for fostering the breed and having it registered in the South African Herdbook. The writer gives the standard of excellence and the scale of points then adopted. Some good illustrations elucidate the text.

155 - Maize Distillery Residues as a Feed for Milch Cows: Influence on the Composition of the Milk.

WEISER, ISTVAN. Friss és szárított moslék befolyása a tej és tejszerum összetételére. — *Köztelek*, Year 22, No. 83, pp. 2862-2863. Budapest, October 26, 1912.

Experiments carried out at the Royal Station for Animal Biology and Feeding at Budapest on the influence of watery feeds on milk yield and the composition of the milk have shown that the amount of water taken by the cows has no influence on the composition of the milk. Of the five watery feeds tried, not one reduced the solid constituents of the milk below the legal minimum.

In the 1912 experiments, in the comparison of the feeding value of wet and dried distillery residues, the writer made a trial as to whether wet residues, given to the cows in larger quantity than the dried, had any effect in diluting the milk.

In an 80 days' experiment, two six-year-old cows from the Innthal, not in calf, were used; during the whole period the milk-yield remained the same. The experiment was divided into three periods: 1) dry feed; 2) wet feed, and 3) dry feed again. Each period was long enough to avoid any after-effects of the previous one. Prior to the commencement of the experiment the cows had been on dry feed.

The first period lasted 12 days; each cow had 20 lbs. of hay, 1 to 2 ¼ lbs. of barley, 1 lb. of pumpkin-seed cake and 4 ½ lbs. of dried maize distillery residue.

In the second period, of 49 days, while the rest of the ration remained the same, the dry residue was changed to wet residue, the amount being varied to study the effect on the composition of the milk; the amount was: first day, 55 lbs. per cow; next 13 days, 72 ½ lbs.; next 19 days, 60 ½ lbs.; next 15 days, 121 lbs.; last day, 60 ½ lbs.

In the third period, bran was given instead of the wet residue.

During the experiment the following were determined: 1) water consumed; 2) yield of milk; 3) specific gravity and fat content; 4) specific gravity and refractive index of the milk serum, this giving indications as to dilution. The water consumed during the experiment was:

	Cow I. lbs.	Cow II. lbs.
Period I: dry feed	60.2	58.4
Period II: wet feed (average). . . .	85.0	81.7
Period III: dry feed	53.8	49.4

Although the cows drank very little water during the wet feed period (no. I taking 5.7 lbs. and no II 2.6 lbs. per day on an average), the total consumption of water in this period exceeded the average of the other two periods by about 50 %.

The following are the figures for the composition of the milk during the experiment:

Period I: dry feed.

	Cow I.				Cow II.			
	Milk		*Milk serum*		*Milk*		*Milk serum*	
	S. G.	% fat	refractive index	S. G.	S. G.	% fat	refractive index	S. G.
Max.	1.0332	4.47	40.9	1.0270	1.0334	4.40	41.4	1.0284
Min.	1.0320	3.90	39.8	1.0267	1.0317	2.80	40.0	1.0269
Av.	1.0323	4.16	40.4	1.0267	1.0327	3.81	40.5	1.0275

Period II: wet feed.

	Cow I.				Cow II.			
Max.	1.0337	4.90	41.0	1.0277	1.0341	5.12	41.0	1.0280
Min.	1.0316	3.00	39.6	1.0258	1.0318	3.20	39.5	1.0267
Av.	1.0325	4.19	40.4	1.0268	1.0331	3.69	40.2	1.0272

Period III: dry feed.

	Cow I.				Cow II.			
Max.	1.0346	4.57	40.6	1.0273	1.0350	4.60	41.9	1.0280
Min.	1.0327	3.95	39.7	1.0267	1.0316	3.35	39.8	1.0264
Av.	1.0336	4.24	40.1	1.0268	1.0335	3.99	40.2	1.0270

It is thus seen that the specific gravity of the milk of both cows rose very slightly throughout the experiments; the average fat content of cow II fell slightly during the wet feed period, but not enough to have any practical significance; the refractive index and specific gravity of the serum showed hardly any change.

These results show that the wet feed caused no diluting of either the milk or the milk serum. Even when the cows were getting abnormal amounts this still held good: during the 14 days of heaviest feeding cow I took 123 lbs. and cow II 130 lbs. of the wet residue per 1000 lbs. live-weight; the following figures show the composition of their milk in this period:

	Cow. I.	Cow. II.
Specific gravity of milk	1.0325	1.0334
Fat content of milk	4.22	3.49
Refractive index of serum	40.4	40.1
Specific gravity of serum	1.0269	1.0271

The writer concludes that feeding large quantities of wet distillery residue does not affect the composition of the milk enough to have any importance in practice.

156 – Cacao Husk as a Feed for Milch Cows.

LUCAS, J. E. Les Coques de Cacao dans l'Alimentation des Vaches laitières. — *Annales de la Science Agronomique*, Year 29, No. 5, pp. 321-347. Paris, November 1912.

The writer gives an account of some feeding experiments which he made with cacao husk for the purpose of ascertaining its effect upon the milk yield of cows. There were four experiments in all; in the first were two lots, in the second three lots and in the third two lots: each lot consisted of four cows. In the fourth experiment two lots, each of three cows, were used. All the lots were as similar as possible.

Each experiment consisted of a preliminary, a principal and a concluding period. Experiments I and II each lasted a month; the two other experiments occupied a somewhat shorter time.

In every case a control lot was fed on rations of bulky food, maize-gluten and bran, while in experiments I and II the bran which the other lots received was gradually replaced by cacao husk; the latter was entirely substituted for the bran in the principal period: 4 $^2/_5$ lbs. of cacao husk per cow per day in the place of 3⅓ lbs. of bran; for a short time 6 $^3/_5$ lbs. of cacao husk was fed. In experiment III only part of the bran in the rations was replaced by cacao husk, and at the conclusion of experiment IV an addition of 750 gr. (1 $^3/_5$ lb.) of cacao husk was made to the full rations containing the usual amount of bran.

During the time of the experiments, every milking was weighed and the fat content of the milk determined by Gerber's test.

The summary of the results of the experiments is as follows:

1. The cacao husk used noticeably diminished the milk yield, the decrease being as much as 20 per cent.

2. At the same time, it increased the fat content of the milk per volume as much as 20 per cent.

3. The cacao husk had little effect on the fat content taken as a whole, although this varied slightly, being sometimes greater and at others less.

The writer states that Faelli (*Moderno Zooiatro* 1898) obtained increased milk yield and fat content by feeding cacao husk; he considers that husks of much fermented cacao decrease the milk yield less than those of little fermented cacao, such as he used in his own experiments.

SHEEP

157 - Contribution to the History of Merino Breeding.

SCHULTE IM HOFE, A. Zur Geschichte der Merino-Schafzucht. — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, No. 50, pp. 690-692. Berlin, December 15, 1912.

1. *Introduction of Merinos into Europe.* — The Merino, whose origin is Asia Minor, travelled by Greece and Italy to reach Spain, whence it spread all over Europe. As early as the second half of the 15th century, Edward IV brought some 3000 Merinos to England from Spain, but did not succeed in permanently establishing them. Three centuries later George III made further introductions, but the breed was again soon given up.

The first Merinos were introduced into France in 1659, but their distribution was limited. New attempts were made in 1752. In 1785 the King of Spain presented Louis XVI with 334 ewes and 42 rams, which formed the nucleus of the famous Rambouillet flock. Later, Spanish nobles presented the Empress Josephine with sheep from some of their best flocks.

Under Frederick the Great, in 1748, some Merino rams were imported into Prussia from Spain; in 1786 100 rams and 200 ewes were introduced. In 1802 400 rams and 800 ewes were imported and distributed among a large number of farmers. During the winter of 1815-16, 900 Merinos were taken from near Paris to Bornstedt near Potsdam; these sheep — 220 rams and 680 ewes — were the foundation of the Frankenfelde (Brandenburg) breed, which was later increased by further importations from France.

The first Merinos to be introduced into Saxony were 92 rams and 128 ewes in 1765. In 1779, 270 more were purchased from Spain.

The Empress Maria-Theresa had 300 Merinos brought from Spain to Hungary, and founded the Marcopail flock. In 1784 the Emperor Joseph brought over 1000 Merinos destined to found the flock of Mannersdorf in Austria, which was afterwards increased by the addition of 2000 others.

In Sweden, Merinos were introduced in 1715 and 1743.

2. *Introduction of wool-growing into Australia and other British Colonies.* The first Merinos were introduced into Cape Colony by a Colonel under the Dutch Government. In 1801 the number did not exceed 1000, while in 1806 it had reached 11000; in 1824, however, the number of fine-woolled sheep was down to 800 again. From this time the Boers undertook wool-growing, and on various occasions imported Merinos from England; recently they have obtained them from Australia. In 1816 the exportation of wool was

20 000 lbs., in 1832 66 000 lbs., in 1836 372 000 lbs., while in 1880 it had reached 46 000 000 lbs.

In the Transvaal and the Orange Free State, the breeding of fine woolled sheep, which was seriously upset by the war, has since looked up again, owing to importations from the Cape. The total exports from the Union of South Africa in 1910 amounted to 120 million lbs., with a value of £3 800 000.

John Mac Arthur was the first to see how well suited were the conditions in Australia for the breeding of fine woolled sheep. He crossed the wool sheep introduced by Captain Philipp in 1788 with 30 sheeep imported from India in 1793 and others obtained later from Cape Colony. In 1804 Mac Arthur brought several Merino rams with him from England. From this period dates the development of sheep-breeding for wool in Australia. The number of sheep rose from 20 million in 1860 to 106 million in 1899, then fell to 53.7 million in 1902; in 1906 there were 71 million and in 1910 about 92 million, with a wool export of 792 million lbs., worth £30 000 000.

The breeding of fine-woolled sheep in New Zealand owes its origin to repeated importations of Merinos from Australia. The first year in which wool exports are mentioned is 1840; in 1858 the number of sheep had risen to 11 ½ million, and in 1910 to 24 million, with a wool export of 200 million lbs.

3. *Merinos in the Argentine.* — The first Merinos were introduced into the Argentine at the beginning of the 19 th century. In 1910 there were 67 million in the country, and the wool export reached 330 million lbs.

4. *Breeding of fine-woolled sheep in German Southwest Africa.* — In 1891 E. Hermann brought about 1500 sheep from the Cape to Kubub in German Southwest Africa to start wool-growing; but the flocks were several times nearly wiped out during native revolts. In 1908, however, their number was 11 000, and in 1911 32 000.

To allow breeding to develop rapidly it is essential to have springs sufficiently copious and persistent to establish fields of lucerne, so as to provide fodder in droughty years. The veterinary organization must be sufficient to prevent infectious diseases becoming plagues. In the large pedigree flocks there should always be enough breeding animals to suppy small farms. Again, larger importations from Australia must be made, and more capital must be devoted to this industry.

158 - Sheep-Breeding Experiments in Alaska.

Annual Report of Alaska Agricultural Experiment Stations for 1911, pp. 32 and 63-64 Washington, 1912.

From the experiments so far carried out at the Kodiak Experiment Station, it seems that sheep breeding may give good results on the south coast of Alaska. In 1910, the Station purchased 40 grade Lincoln and Cotswold ewes and a pedigree ram of each breed; the Lincoln was run with the flock and the Cotswold kept for other experiments.

Long-woolled sheep do best in the wet climate of Alaska; the short close wool of Merinos and their crosses holds the wet, which seriously incommodes the sheep.

The sheep grazed on the mountains in the autumn and early winter of 1910. In the winter they were brought to the Station in excellent condition, and were kept on hay and silage for the remainder of the winter. By night and in bad weather they were brought into the barn, but otherwise were kept out in an enclosure. They wintered very well.

At lambing time (June and early July) in 1911, there were still 35 out of the 40 ewes, besides 20 lambs born in 1910. Three ewes died in the spring of 1911 from a too rapid change from dry feed to grass.

In the summer of 1911 37 lambs were born, and 31 of these lived and did excellently.

Alaka is attracting the attention of breeders from the United States; in 1911 one breeder imported 500 ewe tegs, and other importations are being arranged.

GOATS

159 - The Goat Shows in Goat Sheds Organized by the Chamber of Agriculture of Baden.

SAETTELI, J. E. Die Orts- (Stall-) Ziegenschauen der Badischen Landwirtschaftskammer. — *Zeitschrift für Ziegenzucht*, Year XIII, Nos. 19-20 and 21, pp. 289-293, 310-313 and 327-329. Hannover, October 1 to November 1, 1912.

On the initiative of the writer, the Chamber of Agriculture of Baden have adopted a plan for the improvement of goat-breeding in the Grand Duchy by means of goat shows held in the goat sheds. The whole stock of the goat breeder is judged at these shows according to a scale of points,

The manner in which the animals and their sheds are kept is also taken into consideration.

The scale of points is as follows:

I. — *For the animals.*

	No. of points
1. Breeding (fidelity to type, weight, descent, health)	0 — 3
2. Points (head, skin, hair, conformation of body, chest, width and depth of chest, back, belly, hips, limbs, general appearance)	0 — 3
3. Utility (good milking and fitness for breeding)	0 — 3
4. Evenness of all the stock	0 — 3
Total number of points for the animals	0 — 12

II. — *Points given for other matters.*

1. Condition (especially attention and feeding)	0 — 2
2. State of the sheds (hygienic)	0 — 2
3. Milk test records, stud-book keeping	0 — 4
Total of points for these matters	0 — 8

Prizes were given according to the verdict passed upon the animals: The prizes were:

	Prize I.	II.	III.
For male goats	10 *s.*	6 *s.*	4 *s.*
For female goats	8 *s.*	5 *s.*	3 *s.*

If the breeder receives a minimum of 5 points under scale II, an additional 6*d.* for every such point can be added to the above prize.

In 1912, the first goat-show of this kind was held. In some cases, the animals were found to be badly fed and tended, but the writer hopes that these conditions will be improved, and he concludes by stating the best measures to be adopted for this purpose.

160 - Chicken-Rearing on an Intensive System.

POULTRY

The Journal of the Board of Agriculture, Vol. XIX, No. 9, pp. 721-725. London, December 1912.

An example of intensive chicken rearing is provided by a small holding near London worked by Mr. F. G. Paynter; the holding is a grass field of 3½ acres, on fairly light and well-drained soil. Eggs of table breeds were purchased and hatched in incubators. The chickens were kept in foster-mothers for the first six or eight weeks, and afterwards placed in runs up to the age of 12 or 16 weeks, when they were sold. The runs were 12 yds. × 100 yds., and held 100 to 120 chickens; in each run two small Sussex chicken "arks" provided sleeping accommodation; these were on wheels and could easily be moved about. Mr. Paynter adopted methods of rearing previously tested by him for five or six years, and incubation, attention and feeding were all carried out carefully and methodically. Only fresh material of the best quality was used for feeding, and no cramming was practised. The quantity of food consumed during the season was: wheat 10 978 lbs., fine sharps 7 888 lbs., biscuit meal 3 257 lbs., barley meal 1 827 lbs., meat meal and green bone 1 586 lbs., bran 1 224 lbs., maize 703 lbs., rice 370 lbs., oatmeal 359 lbs., and fat 28 lbs., also about 2 000 lbs. of mixed chicken feed.

It had been intended to start incubation in December, so as to sell the first consignments of chickens in April, when prices are good; but for various reasons it was delayed, and hatching did not begin till the 13th of February. Incubation was stopped in June.

Altogether 2 192 chickens were sold between May 28 and November 1, for a total of £301 5*s.* 3*d.* The expenses were as follows:

	£	*s*	*d*
Purchase of eggs (two to each chicken)	31	13	1
Purchase of day-old chickens	4	19	0
Oil for heating	4	12	9
Food	142	4	3
Occasional outside labour	14	6	2
Total . . .	£197	15	3

There was thus a margin of £103 10s. for the labour of the small hoder, rent, deterioration of equipment, risk and interest on capital; there was also the value of the manure, which was regularly swept up.

The cost of the incubators, fencing, houses and all utensils reached £150 odd; a further £50 to £100 would be required as ready money for purchasing eggs and food, before the returns began.

An essential feature of the management was that no adult birds were kept; this enables the holder to devote all his attention to the chickens, and greatly reduces the risk of outbreaks of infectious disease.

The Board of Agriculture has arranged with Mr. Paynter to carry on his system this year in Cheshire, as a demonstration to the small holders in that county.

161 - An Export Trade in Eggs. Views of the South African Trades Commissioner.

The Agricultural Journal of the Union of South Africa, Vol. IV, No. 5, pp. 748-752. Pretoria, November 1912.

The imports of eggs into the United Kingdom for the year 1911 totalled over 19 000 000 great hundreds (120 eggs), value £7 967 555. The following are the figures in regard to the ten chief countries of origin.

Country	Quantities in great hundreds	Total values	Values per great hundred
		£	s d
Russia	10 041 890	3 796 408	7 6 1/2
Denmark	3 992 986	2 030 607	10 2
Austria Hungary	1 022 554	428 869	8 4 3/4
Italy	771 107	366 859	9 6
Egypt	687 335	222 853	6 5 3/4
France	652 036	303 515	9 3 3/4
Netherlands	607 364	282 805	9 3 3/4
Germany	577 545	233 142	8 1
Sweden	344 289	157 067	9 1 1/2
Morocco	214 960	84 967	7 10 3/4

In 1911 the Cape of Good Hope exported to the United Kingdom twenty-two great hundreds of eggs which, however, realized 11 *s.* 10*d.* per great hundred, the highest price of any of the imported eggs. The average price *for the year* was about 8*s.* 4½*d.* per great hundred, the lowest being 5*s.* 4*d.* per 120 for Chinese eggs.

South Africa imports considerable quantities of eggs, but this import is practically limited to the months between February and August, so that it might be possible during the rest of the year to satisfy the home demand and to supply an export trade.

Eggs imported into the Union of South Africa during the year 1911.

	Quantity	Value
		£
January	14 400	60
February	495 446	2 163
March	3 405 839	15 072
April	3 699 190	14 302
May	4 623 564	15 813
June	3 835 056	7 701
July	650 810	1 928
August	78 252	220
September	5 000	27
October, November, December	nil	nil
Total	16 807 548	£ 57 286

There are several large areas in South Africa where eggs and dairy produce can be produced cheaper than in other countries which export these articles. The reason why these commodities are not produced for export in South Africa is due chiefly to the difficulty of collecting (the population being very widely scattered) and of transporting them. All countries which export eggs are closely populated and often have to import food-stuffs. Still the advantages of a speedy and cheap collection are so great as to enable those countries to compete on the large markets of the world.

On account of the want of large markets, the South African agriculturists have had to confine their efforts to the production of non-perishable products such as wool, mohair, ostrich feathers, wattle bark, and lately maize. During recent years fruitgrowers have, with the aid of cold storage in ships, been enabled to export their fruit, and a high industry has thus been created. Trial shipments of butter have recently been made with satisfactory results. In the same way an export trade in eggs could be created during the period of the year when they are plentiful in South Africa. The question of collecting will probably be solved by the aid of co-operation.

The Union-Castle Steamship Company is disposed to carry some trial shipments of eggs from South African ports at 25*s.* per ton measurement, and poultry, in cold chamber, at 50*s.* per ton of space occupied.

Prices of eggs on the English market from November 1911 *to January* 1912.

Country of Origin.	Price per 120 eggs		
	Average	Highest	Lowest
	s d	s d	s d
England.	17 11	23 0	11 6
Russia	9 8 1/2	12 0	7 6
Denmark	15 10	22 0	10 6
Hungary	10 0 1/2	11 9	7 6

For the English market the colour of the eggs, whether white or brown-shelled, is a matter of indifference, provided that they are of a uniform colour and size in each box. The eggs must be cleanly laid, ***not washed***, and of a fairly good size and weighing from 13 to 16 lb. per trade hundred (120 eggs).

The writer has made himself acquainted on the English market with the best methods of packing eggs adopted by the chief exporting countries, and recommends the cases used for the import of eggs into South Africa. These are lined with brown paper tarred on one side, and very dry oat straw. The eggs are packed in layers of five rows of sixteen and seventeen alternately, embedded in dry oat husks. Between each layer of eggs and the next one there is a double sheet of newspaper, oat straw and more newspaper. Four layers of eggs form a case. The writer recommends placing a double division in the middle of the cases so that they can be divided by sawing into two half cases which are sold to small dealers.

BEES

162 - Mendelian Methods applied to Apiculture.

SLADEN, F. W. L. in *The Canadian Bee Journal*, Vol. 20, No. 12, pp 357-367. Brantford, Ont., Canada, December 1912.

The study of Mendelism in the bee is hampered by several special difficulties. Firstly mating cannot be controlled in the ordinary way. Then there is the parthenogenetic production of the drone. Thirdly the honey-bee is a highly specialized animal, and varies very little. There is some variation in size, the eastern races being smaller than those of the west, but apart from this the colour of the upper or dorsal side of the abdomen is the only visible character that varies strikingly.

In the workers in *Apis indica*, in the Abyssinian bee and in the artificial varieties known as golden bees, the yellow extends over the three basal segments and more or less of the basal part of the fourth segment. The scutellum on the posterior part of the thorax is also yellow. Extreme goldens, with the fourth segment entirely, and the fifth segment more or less, yellow have also been bred, but it appears that they do not breed true. In Italians the three basal segments are bordered at the edges with black and the scutellum is darker. Italians from the Swiss Alps have the black bands wider than the Italians from the Ligurian Alps, while Cyprians have them narrower. Races with the abdomen entirely black occur in Britain, France, Germany, Malta, and other places. For some years the writer has been engaged in breeding a golden bee known as the British golden bee. This bee was extracted from crosses between English blacks, Italians and American goldens. The golden character was soon isolated, and thenceforward it was found possible to maintain the pure golden breed, though many of the queens were mated with blacks and produced hybrids. No attempt was made to increase the area of the golden colour, which in the queen extends much further back than in the worker. The factor or factors that produce a half yellow and half black abdomen in the worker produce an almost entirely yellow one in the queen. There is no difference in the gametes ; the difference is merely a fluctuation in the zygote caused by a difference in the food supplied in the larval stage. Since the work of breeding British goldens began in 1902 a large number of pure golden queens have been bred ; about 1500 of them were kept until their young workers were hatched, and notes were made of the colouring of these. They were golden and intermediate. Not a single black worker was seen. Most queens produced a considerable proportion of each type, but some produced all goldens, and some all intermediates.

It was evident that the queens that produced all goldens had been mated by a pure golden drone ; in fact the most numerous golden families were from the matings that took place at the end of each season, when most of the drones in neighbouring apiaries had been killed off, and from the matings that took place in cold and windy weather and therefore close to the apiary.

It was also reasonable to believe that the intermediates were the result of the union of the golden queens with pure black drones (out of five queens mated at a spot nearly two miles from the apiary four produced all intermediates and one about nine intermediates to one golden). Without doubt the queens that produced goldens and intermediates had mated with heterozygous drones. The proportion of the two types of workers varied considerably : from

Intermediates : golden : : 9 : 1 (one case)
Intermediates : golden : : 1 : 30 (one case)
A common proportion was
Intermediates : golden : : 3 : 7, perhaps 1 : 2.

The proportion of goldens to intermediates has been found to be the same in the queen progeny as in the worker progeny.

The worker offspring of about 30 of these intermediate queens were examined and in every case they consisted of goldens, intermediates and blacks, thus proving that segregation of golden from black takes place. The proportion of the three forms varied in different cases, but the intermediates were usually in excess of the goldens and the blacks. In many cases almost every degree of coloration between golden and black appeared, but the bees of the same shade were in different proportions in the various offspring.

The interpretation of the results obtained is rendered difficult through not knowing the drone fathers. Nevertheless they indicated Mendelian inheritance. The appearance of an almost continuous series of intermediates shows that probably more than one factor is here at work.

As a conclusion of practical value, it appears from the foregoing that if the characters that are wanted depend upon the heterozygous nature of the heterozygotes, the way to get them is to breed together the two pure homozygotes. Thus from the union golden × black all intermediates are got, whereas from the union intermediate × intermediate only a proportion of intermediates are obtained.

The union between golden queen and black drone is practically attainable on a large scale, and their offspring possesses certain qualities that are very desirable. The workers show themselves vigorous, hardy and industrious ; the intermediate is considerably larger than the golden (in both queen and worker) and slightly larger than the black. The colonies are very populous, the golden queens being more prolific than the black ; their temper is usually good, though it becomes hotter in later generations when the black colour predominates.

As it is not possible in the case of bees to control matings by means of isolation, the only way of obtaining desirable characters seems to be fixing them by selection in the queens. A desirable character may appear not in the queen but in the worker (for instance, exceptional industry). For such characters the colony must be considered as the unit.

It is generally admitted that the drones are produced parthenogenetically and it is proved that a queen which has not been fertilized produces drones only. But are *all* the drones produced by a *fertilized* queen the result of parthenogenesis ? Perez in 1878 thought not, because on examining 300 drones produced by an Italian queen fertilized by a French black drone he found 149 which he thought indicated hybridism.

If it is true that drones are always produced parthenogenetically, the queen, provided her gametes be pure, must produce pure drones, no matter what kind of drone has fertilized her. The writer has bred drones from about half-a-dozen of his golden queens every season for some years. Some of these golden queens were producing only golden workers, some produced certain proportions of intermediates, others only intermediates. The drones from the queens producing all golden workers were all golden, as were also the drones from most of the queens producing some or all intermediate workers, but two of these queens produced certain proportions of darker drones.

In trying to explain this remarkable result one is apt to suspect that the queen was not producing pure golden gametes, but the facts that the queen had the scutellum and the abdomen almost to the tip yellow, and that a queen thus colored had never been known to produce a black worker, oppose this view. In conclusion the writer does not consider that this observation seriously endangers the theory that the drone is always produced parthenogenetically, but is of opinion that cases such as this should receive the fullest investigation.

In Italian bees, the workers all come perfectly true to a color pattern very like that of the cross between English golden and black, while the queens, on the contary, show immense variation. The question arises, are these differences in the queen mere fluctuations or do they stand for factors in the gametes which do not manifest themselves in the workers ?

It would be interesting to ascertain if Mendelian rules are followed in the inheritance of the bands of short white hair, which, in the Italian bee of Carniola, is highly developed on each segment, except the first and the last, and which is but feebly developed in the English black bee.

Italian bees enjoy justly a world-wide fame, but in England, owing to the summer climate not being warm enough for them, the Italian-English half-breds usually produce better results. One of the best qualities of Italians is their resistance to the disease known as European Foul Brood (1), and it would be well worth while to try to discover whether this quality is shared by the Italian-English half-breds. A strain might perhaps be bred to resist that still greater scourge the Isle of Wight Disease (2).

163 – Notes on Bee-keeping in Australasia.

HARDWICK, L. L. in *The Agricultural Journal of South Africa*, Vol. IV, No. 5, pp. 745-747. Pretoria, November 1912.

This paper is the result of data and information collected during a journey in the Commonwealth.

The first thing that struck the writer was the huge "takes" of honey in Australia, no less than 200 lbs. being considered as fair, and this where up to 500 colonies are kept. The chief nectar producing plants are the various gum and boxwood trees. Experience has shown that Leather Colour and Golden Italian bees have been found to be the best suited to the requirements of the bee keepers, and large numbers are reared annually; as much as 15s. is paid for a select tested queen of this variety. In New South Wales the hive which has practically been adopted as the standard is the Longworth. In Victoria an Act has been passed, coming into force on the 1st of January 1913, prohibiting the keeping of bees in anything but moveable frame hives. A similar law was enacted in New Zealand six years ago, the Apiaries Act, 1907, requiring every bee-keeper to give notice to the Secretary for Agriculture of any disease found to exist in his apiary; a visit is then paid by an inspector, who either orders that the diseased colonies be destroyed or leaves instructions for their treatment. Within six months of the passing of this Act no bee-keeper was allowed to keep his bees in other than frame hives, and further, should the inspector discover a hive where the frames could not readily be removed, he has the power to order that the bees be transferred to another hive within a specified time. By this means they hope in time to get rid of foul brood and other bee diseases.

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(1) See No. 1202, *B.* Aug.-Sept.-Oct. 1912. (*Ed.*).

(2) Caused by *Nosema Apis*. See No. 1849, *B.* Aug.-Sept.-Oct. 1912. (*Ed.*).

Large extractors carrying six and eight frames are in general use, and larger ones driven by small engines are also made. A firm in New South Wales has patented a machine to dispose of the cappings. It is really one tank inside the other, the space between being occupied by water kept at the proper temperature by a paraffin stove placed underneath. The cappings, as they are cut from the frames, fall on to a grating and then to the bottom of the inner tank, where the wax melts and flows out by the adjustable outlets, the upper of which delivers only pure wax, which is lighter than the honey and other impurities.

The honey is put up in tins ranging in size from 1 lb. up to 60 lbs. Tins of 56 lbs. are generally used for export. The wholesale price for honey in Australia in 56 lb. tins is usually about 2 $^{3}/_{4}$ *d.* per lb., but even at that figure apiarists are able to make a good living out of bee-keeping.

To provide an outlet for such large quantities of honey, the Government instituted a Co-operative Union in which the farmers have shares. The Union, besides honey, receives also other produce for export. The farmer delivers his produce at the stores and at the same time receives the wholesale market price, less a small commission for working expenses. The Union controls the market, securing supplies when they are wanting and preventing overstocking.

In Victoria, a strong association known as the "Victoria Apiarists Association" exists, the special function of which is the holding of an annual conference. The executive have recently been successful in obtaining reduced railway charges for honey and bee appliances over the Victorian Railways.

In Victoria a disease has been discovered, which appears to be limited to that State and which has been termed D. T. or "disappearing trick". It is believed to be due to malnutrition of larvæ, bee paralysis, and *Nosema apis*. As the name suggests, the bees disappear rapidly, but no more dead bees are found round the hives than would be found around any healthy stock.

The other bee diseases known in Australasia are foul brood and paralysis, but these cannot be described as being very prevalent. W.

164 — The Fungi of the Bee-Hive.

BETTS, ANNIE, D.: *The Journal of Economic Biology*, Vol. 7, No. 4, pp. 129-162. London, December 1, 1912.

A short account is given of the previous work that has been done, from 1854 to 1912, on the fungi present in bee-hives; and some questions arising from these records are discussed. A general description of the conditions prevailing in the hive, and of the distribution of fungous growth in it, are given. The following twelve fungi are described and illustrated:

Probably confined to the hive: *Pericystis alvei, Oospora favorum* (not a common species).

Adapted to hive-life, but not confined to this habitat: *Gymnoascus setosus*; *Eremascus fertilis* (not common).

Common, but not specially adapted to life in the hive: *Penicillium crustaceum, Aspergillus glaucus, Citromyces subtilis, C. glaber, Mucor erectus* (chiefly, if not exclusively, found on dead bees).

Occasionally present: *Aspergillus nidulans* (probably absent from healthy stocks); *Sordaria fimicola* and *Gymnoascus ruber* (coprophilous).

The literature cited, including 30 papers, is appended.

165 – Fish-Breeding in the Streams of the Domanial Forests of Hungary.

FISH

SIMONFFY, GYULA. A-m. kir. kincstári erdöségek halasvizei. — *Erdészeti Lapok*, Year LI, Parts XIX, XX, XXI, XXII and XXIII, pp. 779-799, 834-853, 898-908, 934-939 and 970-976. Budapest, October 1 and 15, November 1 and 15, December 1, 1912

In Hungary, most of the domanial forests are situated in the west and north of the country; there are also the principal groups of plain forests (Alföld). According to the ministerial report of 1910, the area under the forest administration amounts to 3 214 853 acres. Under the natural conditions obtaining in Hungary, which is very well supplied with water, the streams form a large network within these estates and the profits derived from the fish, etc., which are under the charge of the forest fiscal administration, form an important part of the revenues of the State.

According to the data collected by the Ministry of Agriculture, the whole of the area belonging to the Treasury which can be employed for fishery purposes is 43 493 acres. The streams which are known and classified have a total length of more than 3000 miles. The area which they water is administered by 124 forestry officials. The right of fishing in this territory does not belong exclusively to the Treasury, but is shared also by the owners of properties adjoining the streams. As the Treasury possesses the right of fishing both on the plain and in the mountain streams, the fish over which it has control include all the species which usually inhabit fresh water in Hungary, notably the following species: perch (*Perca fluviatilis*), pike-perch (*Lucioperca sandra*), *Aspro communis*, ruff (*Acerina cernua*), miller's-thumb (*Cottus gobio*), *Cobius marmoratus*, burbot (*Lota communis*), carp (*Cyprinus carpio*), Prussian carp (*Carassus vulgaris* and *C. gibelio*), tench (*Tinca vulgaris*), barbel (*Barbus fluviatilis*), Petény barbel, gudgeon (*Gobio fluviatilis*), bitterling (*Rhodeus amarus*), bream (*Abramis brama*), bleak (*Alburnus lucidus*), *Idus ieses*, roach (*Leuciscus rutilus*), minnow (*Phoxinus laevis*), loach (*Cobitis barbatula*), *Chondrostoma nasus*, sheatfish (*Silurus glanis*), grayling (*Thymallus vulgaris*), trout (*Salmo fario*), salmon (*S. salar*), shad (*Alosa vul-

garis), eels (*Anguilla*), sturgeon (*Acipenser sturio*) and lampreys (*Pteromyzon*).

The number of fish in the streams varies according to the prevailing conditions ; as a rule there are few and in some streams none. The cause of the decrease is chiefly a too great extension of fishing rights. In the face of these regrettable circumstances, the forestry administration shows a commendable activity, devoting its whole care and efforts to the subject of fish-breeding. There are at present 37 establishments for the artificial incubation of trout eggs ; these institutions work under the direction of the administration of the domain and are mostly furnished with Californian apparatus, the number of the latter being 279. In addition, there are 6 breeding ponds for rearing trout fry, which remain there throughout a summer. Thanks to these measures 1 470 000 eggs of river trout and rainbow trout have been hatched in the above-mentioned apparatus in the course of the year, and from these, 972 000 young fish were transferred to the ponds.

It should be noticed, that the administration of the Domain is greatly supported by the Royal Fishery Inspection, which has its seat in a Bureau attached to the Ministry of Agriculture. This bureau has fixed the localities for the establishment of Stations for artificial incubation, and of breeding ponds, and has distributed gratuitously the incubation apparatus and the trout eggs. The cost of these installations under the administration of the domanial forests is about £833, estimating the average expense of building the stations and making the ponds at £16 10*s.* each, and that of the apparatus at 8*s.* 4*d.* each. The whole number of eggs which have recently been hatched artificially represents a sum of £25, reckoning 3*s.* 4*d.* per thousand eggs.

The streams of the Royal Domain are turned to account in different ways. Most of them are let with the land, but some of them are not used; sometimes the fishing rights are let with the shooting.

Fish and fishing licences bring in annually the sum of £2250 for 37 650 acres. Nevertheless, seeing that of all the domanial land watered by streams, 5841 acres are at present not utilized, and that their utilization would greatly increase the revenue, it would be interesting to know the value they represent. In order to make this estimate, it is necessary to classify the extent of these streams according to the principal regions where the different fish are found :

	Area in acres	Actual revenue per acre
1. Bream district	33 021	2*s.* 1*d.*
2. Trout district	5 345	1*s.* 11*d.*
3. Barbel district	5 127	8½*d.*

Thus if these streams were utilized and the average rent of such streams was obtained, which is taking the minimum sum, in this case the revenue from the streams of the Domanial forests would be :

	£
Streams with bream	3483
Streams with trout	517
Streams with barbel	180
Total	£4180

The annual return from trout streams is very variable. According to the data collected by each of the Central Forestry Bureaus, it varies between 3*d.* and 5*s.* 7*d.* per acre. Taking these figures as a basis, it is clear that these trout streams might bring in an additional sum of from £70 to £1460. The following calculations show how the revenue from the trout streams could be increased.

It is well-known that, under normal conditions (presupposing some attention being paid to the streams and their stock of fish) a stream of one acre can produce from 23 to 39 lbs. of trout. Taking 2*s.* per lb. as the minimum sale price of the fish, the net revenue from one acre of water would average about £3; thus the revenue of the 5345 acres of trout streams would be about £16 000; this sum could even be increased in a few years, if the Administration continued its present exertions in promoting and extending systematic breeding of fish.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

166 – Trial of a Dodenhof-Meyer Manure Distributor.

REZEK, JOS. Prüfung eines Düngereinlegers System Dodenhof Meyer. — *Wiener Landwirtschaftliche Zeitung*, Year 62, No. 100, p.1151. Wien, December 14, 1912.

Two manure distributors on Dodenhof-Meyer's system were sent to be tried. One was provided with an interchargeable plough-share, which the other lacked. Their weight was 12 lb. 2 oz. and 11 lb. respectively. They consist of a screw-shaped steel plate with a shaft by means of which the apparatus is fastened to the beam of the plough instead of the coulter. Its action consists in rubbing the fertilizer into the furrow made by the plough.

From the experiments made it appears that the apparatus increases the resistance to traction of the plough by 44 to 57 lbs.

The quality of the work performed was excellent in every trial. The manure was completely and uniformly ploughed in, and it seems that the apparatus will also be useful in dealing with green manures.

167 – Tapping Rubber Trees by Electricity.

The India Rubber World, Vol. XLVII, No. 3, pp. 142-143 + figs. New York, December 1, 1912.

George M. von Hassel has devised an apparatus for tapping rubber trees by electricity. Upon the trunk of the rubber tree is placed a piece of sheet-iron about 5 ft. long, 5 in. wide, with the two sides folded back against the tree to a thickness of about 2 inches, constituting a hollow channel of sheet-iron. This hollow channel is divided into a series of 15 to 30 sections; the number of sections depends upon the number of days the apparatus is to be worked. Each section has a mechanism for the extraction of the latex from the rubber tree and a receptable for receiving the flow, which also contains an acid preparation for the coagulation of the latex. When working *Hancornia* and *Castilloa* trees, plates provided with longitudinal canals, in which the latex coagulates spontaneously in threads, are used instead of the receptacles for gathering the latex, and the product thus obtained is known as "Sernamby."

The method of operating is as follows: The above described device is fastened against the rubber tree. If it is a small tree there will be two of them; if it is a large one there may be as many as nine circling the tree and about a hand-span apart. This apparatus is connected by an insulated wire with similar apparatus on all the other trees to be tapped and with a central station which is equipped with electric power. A machine devised by the inventor makes it possible to send the electric current so that it will set each section in motion separately. When the first section is at work the latex oozes out and flows into the receptacle immediately beneath. The next day — or preferably 48 hours later — the current is turned on to the second section, which in its turn taps the tree and so on for all the sections. After 30 or 60 days nothing remains to be done but to collect all the rubber at one operation.

168 - **Spraying Machines in Malaysia.**

ALEXANDER, D. C., jr. in: *Daily Consular and Trade Reports*, 15th Year, No. 284, p. 1143. Washington, December 3, 1912.

There is a large market for spraying machines in the Federated Malay States, and the writer believes that there is also a good demand for the same machines among the rubber growers in Java, Sumatra, and Ceylon.

On practically every rubber estate in the Federated Malay States several spraying machines are in constant use, both for spraying the rubber trees and for spraying and killing the lalang grass, or weed. This grass, which seems to spring up as soon as the jungle is cleared, sinks its roots so deeply as to interfere seriously with the root nourishment of the young rubber trees. Indeed most planters consider lalang their greatest enemy, and large sums are spent annually in combating it.

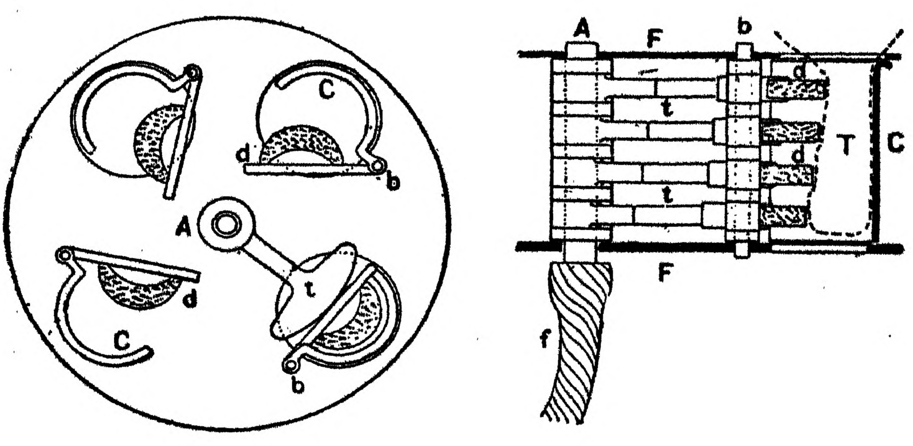
When the young trees are set out they are spaced about 20 ft. apart, and the lalang is dug out along the lines with "chukohs" (hoes). When once the trees are fairly started, spraying with a herbicide is usually substituted for the more expensive hoeing, though the usual chemicals applied do not kill the roots and have therefore to be applied at frequent intervals. The herbicide most generally used is arsenite of soda.

Two or more types of spraying machines are used on the rubber estates. The larger ones, for tree work, are mounted upon small trucks drawn by horses or coolies. For spraying lalang, the most popular machine is a knapsack, as it can be used by a coolie upon steep hillsides where a truck could not go.

169 – A Milking Machine at the Central Competition at Amiens.

COUPAN, G. Une Machine à traire au Concours Central d'Amiens. — *Bulletin de la Société des Agriculteurs de France*, December 1, 1912, pp. 378-379. Paris, 1912.

At the last Central Agricultural Competition held at Amiens, the Paris firm "la Galakton" showed a milking-machine of which the principle is diagrammatically shown by our figure. The apparatus is almost in the shape of a flat cylindrical box, of which the top and bottom are formed by two plates F, each furnished with four large holes arranged in the same manner as the teats on the cow's udder. Between the plates and perpendicular to them, are four hollow half-cylinders, C, of aluminium, against the concave surfaces of which the teats are placed; to extract the milk, each element C is provided with a series of four or five metallic fingers, *d*, each ending in a thick cushion of rubber; the fingers move on an axis *b*, parallel to C, from which it is held away by a spring. In the centre of the apparatus, there is an axis A, which is revolved by a flexible tube *f* connected with any part of a machine with a rotatory movement; this axis A bears four or five rods, *t*, which during the rotation push successively each of the fingers of the milking elements C. As shown in the right-hand portion of the figure, these different fingers are not superposed exactly one over the other, but are slightly out of line, so that the one at the highest level works first, and the others rapidly follow it one after another. Thus the teats in the half-cylinders C are first compressed near their insertion on the quarters, then progressively from top to bottom, towards their extremities; this process extracts the milk without any need of mechanical suction. There are also fairly simple adjustments for the adaption of the machine to differently shaped udders, and a harness, rapidly adjusted to the animal, supports the machine while at work.



Average standing working capital on 100 farms in Silesia.

Class of farm	Total live stock (in head of large cattle) per 100 acres. Number	Total live stock (units) on 100 acres. Value	Draught stock (units) on 100 acres. Number	Draught stock (units) on 100 acres. Value	Total dead stock on 100 acres. Value	Productive cattle on 100 acres. Number	Productive cattle on 100 acres. Value	Total dead stock corresponding to 1 unit of draught stock. Value
		£ *s* *d*		£ *s* *d*	£ *s* *d*		£ *s* *d*	£ *s* *d*
All the 100	21.27	16 0 1	4.24	4 8 4	7 3 7	12.46	9 9 11	— 13 10
Yield up to 200 marks per ha. (£ 4 per acre)	17.42	12 1 10	3.31	3 2 0	5 10 9	—	—	—
Yield between 200 and 500 marks per ha. (£4 and £10 per acre)	20.99	15 4 7	4.23	4 7 8	7 1 3	—	—	—
Yield above 500 marks per ha. (£10 per acre).	27.38	22 3 3	5.46	6 4 11	8 16 2	—	—	—
Size I, up to 250 acres	29.80	22 3 7	5.78	5 7 6	12 9 3	—	—	—
Size II, 250 to 625 acres	23.77	18 1 1	4.40	4 17 4	7 15 3	—	—	—
Size III, 625 to 1000 acres	19.20	14 12 8	4.08	4 3 11	6 10 11	—	—	—
Size IV, 1000 to 1500 acres	17.52	22 19 2	3.78	3 15 4	6 1 4	—	—	—
Size V, above 1500 acres	16.16	10 9 11	3.76	3 3 3	3 8 4	—	—	—
Distance from railway up to 3 km. (1.8 miles)	—	—	4.28	4 15 8	—	—	—	—
Distance from railway 3-6 km. (1.8-3.6 miles)	—	—	4.38	4 9 2	—	—	—	—
Distance from railway over 6 km. (3.6 miles)	—	—	3.97	3 16 6	—	—	—	—

stock in the inventory, while the whole productive stock is 59.32 per cent.

8) The value of total dead stock per acre of cultivated area is £1 8*s.* 9*d.*

9) The average value of the dead stock diminishes with the extent of the cultivated area.

10) The average amount of dead stock increases as the farming becomes more intensive.

11) The amount of dead stock corresponding to each unit of draught stock is £34 5*s.*

12) The average value of the whole of the dead stock is 44.88 per cent. of that of the whole of the live stock in the inventory.

172 - **Wages of Farm Labour in the United States.**

HOLMES, GEORGE, K.: *Nineteenth Investigation, in 1909, continuing a Series that began in 1866.* — *U. S. Department of Agriculture, Bureau of Statistics - Bulletin* 99. Washington, November 1912.

The present report contains the results of 19 different investigations into the conditions of agricultural wages in the United States and reaches back to 1866, in which year, for the first time, the average rates of wages in the United States were scientifically determined. The writer gives first a summary of the information he was able to obtain concerning the condition of agricultural wages previous to 1866. Most of this information was found in the works of the statistical bureaus of the various States, in old crop reports, and in the old year books of some farms.

They rarely afford average rates of wages, but only the wages of certain kinds of agricultural labour. From the above summary it appears that agricultural wages in the second half of the eighteenth and in the first half of the nineteenth century were relatively high in the United States, and further that economic disturbances, such as those caused by a war, exert a great influence on the rates of wages.

After some explanations on the method followed in calculating the average rates of wages, the writer gives tables of the average wages from 1866 to 1909 and for the several States, for the geographical divisions of the United States, and lastly for the whole of the Federal territory.

The monthly wages for male labourers which are engaged by the year, without board, were lowest in the South Atlantic States and highest in the western States; the average figure for the United States was $15.50 (£3 3*s.* 9*d.*) in 1866; it rose then to $17.10 (£3 10*s.* 4*d.*) in 1875, it fell to $16.79 (£3 9*s.* 1*d.*) in 1878 and rose continually till 1909 when it reached $25.46 (£5 4*s.* 9*d.*) When board was supplied the western group of States still returns the highest figures, namely $31.30 (£6 8*s.* 9*d.*), then follow the northern central States with $22.22 (£4 11*s.* 5*d.*), the north Atlantic States with $20.73 (£4 5*s.* 3*d.*), the southern central States with $14.25 (£2 18*s.* 8*d.*) and the south Atlantic States with the lowest rate of wages: $13.10 (£2 13*s.* 11*d.*).

When the labourers were hired only for the season the average wages, with board, for the United States were in 1866 $12.69 (£2 12*s.* 3*d.*), in 1869 $12.65 (£2 12*s.* 0½*d.*), in 1875 $13.53 (£2 15*s.* 8*d.*), and in 1909 $20.80 (£4 5*s.* 7*d.*). In this year the corresponding wage in the western States was $35.32 (£7 5*s.* 4*d.*), in the northern central States $25.42 (£5 4*s.* 7*d.*), in the northern Atlantic States $24.56 (£5 1*s* 0½*d.*), in the southern central States $16.57 (£3 8*s.* 2*d.*), and in the southern Atlantic States $15.13 (£3 2*s.* 3*d.*).

When for the calculation of the average monthly wages, the wages of the labourers engaged by the year together with those hired only for th season are used, the following are found : For 1891 in the whole of the United States $13.48 (£2 15*s.* 6*d.*). During the industrial crisis of the nineties wages fell, but rose again to $13.90 (£2 17*s.* 2*d.*) in 1899, to $15.51 (£3 3*s.* 10*d.*) in 1902, $18.75 (£3 17*s.* 2*d.*) in 1906 and $20.01 (£4 2*s.* 4*d.*) in 1909.

According to the reports of the Inland Revenue the total amount of agricultural labourers' wages rose from $357 391 930 (£73 513 733) in 1899 to nearly twice as much, namely $651 611 287 (£136 769 951), in 1909. If it be considered that the average rate of wages had risen only by about 30 per cent. and that the number of labourers has certainly not doubled within the 10 years, the great increase in the total can only be explained by assuming that the time during which agricultural labourers are engaged in the course of the year has of late years considerably increased. The average amount of wages paid per farm was $62 (£13 0*s.* 3*d.*) in 1899 and $102 (£21 8*s.* 2*d.*) in 1909.

The average daily wage for harvest work, board being given at the same time, amounted in 1866 to $1.04 (4*s.* 5*d.*) and rose in 1875 to $1.18 (4*s.* 10*d.*) . It then fell and rose reaching $1.20 (4*s.* 11*d.*) only in 1881, after which it sank to $0.96 (3*s.* 11½*d.*) in 1895 and rose again to $1.23 (5*s.* 1*d.*) in 1902 and $1.43 (5*s.* 11*d.*) in 1909. The highest daily wages were $2.02 (8*s.* 4*d.*) in the western States in 1909, the lowest $1.03 (4*s.* 3*d.*) in the south Atlantic States. The average daily wages for other than harvest work in the United States were $0.64 (2*s.* 8*d.*) in 1866, $0.68 (2*s.* 10*d.*) in 1875, $0.70 (2*s.* 11*d.*) in 1881; they remained about stationary till 1898 and then rose in 1899 to $0.75 (3*s.* 1*d.*), in 1902 to $0.83 (3*s.* 5*d.*) and to $1.03 (4*s.* 3*d.*) in 1909.

For the whole Federal States the average monthly wages rose from 1866 to 1909 by 78.9 per cent. for hands engaged by the year, and by 63.9 per cent. for those hired only for the season. The daily wages for harvest work rose from 1866 to 1909 by 37.5 per cent. and for other work by 60.9 per cent.

The oscillations in the rates of wages are illustrated by a diagram which shows at a glance that the industrial crises of the seventies and of the nineties depressed agricultural wages, which rose considerably from 1890 to 1908.

The writer remarks further that the wages in money do not represent the whole earnings of the agricultural labourers, who often get supplements in the shape of supplies in kind or of the use of dwellings, stables, gardens, pastures, etc. These supplements are valued very differently according to circumstances, in the several States and even in various parts of the same State. The monthly value of a dwelling house and garden is estimated at $1.75 to $5 (7*s.* 2½*d.* to £1 0*s.* 7*d.*) when the labourer gets board also, and $1 to 4.50 (4*s.* 1½*d.* to 18*s.* 6*d.*) when he does not.

The average value of the forage for a cow, a horse, a pig, or for poultry is set down at $1.11 to 3.11 (4*s.* 7*d.* to 12*s.* 9½*d.*) per month. The average monthly value of pasturage for a cow, a horse or a pig amounts to $0.65 to 1.61 (2*s.* 8*d.* to 6*s.* 8*d.*). Wood for fuel and the use of the team to fetch it is considered equivalent to $1.06 to 2.39 (4*s.* 4*d.* to 9*s.* 10*d.*) per month.

Between 1890 and 1907 the wages of agricultural labourers rose much more than those of hands engaged in the industries. The average figures of the latter between 1899 and 1907 are 11.20 per cent. higher than those between 1890 and 1898, while among agricultural labourers the corresponding increase is 21 to 26.6 per cent.

The value of the labourer's board was estimated at $5.41 (£1 2*s.* 3*d.*) per month in 1866, at $6.20 (£1 5*s.* 6*d.*) in 1880, and at $7.41 (£1 10*s.* 6*d.*) in 1909. In the case of daily wages at harvest time the value of the food was considered to be $0.30 (1*s.* 3*d.*) in 1866; during the industrial crisis of 1894 it fell to $0.21 (10½*d.*) and rose to $0.28 (1*s.* 2*d.*) in 1909. During the rest of the year it is valued $0.02 to 0.03 (1*d.* to 1½*d.*) less per day.

In 1866, the daily wages for harvest work were, on average, paid $0.44 (1*s.* 10*d.*) more than for other farm work; in 1880 this difference amounted to $0.57 (2*s.* 4*d.*), in 1894 to $0.34 (1*s.* 5*d.*) and in 1909 to $0.42 (1*s.* 9*d.*).

When the labourer was hired only for the season the monthly wages were in 1866 $2.58 (10*s.* 7½*d.*) and in 1909 $2.79 (11*s.* 6*d.*) higher than when he was hired for the whole year.

In the second and smaller part of the report, the writer gives a review of the results of three enquiries (1902-1906-1909) on the conditions of wages for female domestic labour in the country.

In 1909 26.4 per cent. of the female servants were hired for the whole year. The highest percentage is 40.6 in the north Atlantic States, then follow the south Atlantic States with 30.8, the northern central States with 23.1, the southern central States with 22.7 and lastly the western States with 22.3 per cent.

The average monthly wages of these servants amounted in 1902 to $8.69 (£1 15*s.* 9*d.*), in 1906 to $10.80 (£2 4*s.* 5*d.*) and to $10.39 (£2 2*s.* 9*d.*) in 1909. In 1909 they were highest in the western States $18.74 (£3 17*s.*); then followed the north Atlantic groups of States with $11.59 (£2 7*s.* 8*d.*), the northern central States with $11.38 (£2 6*s.* 10*d.*), the southern middle States with $8.22 (£1 13*s.* 10*d.*) and lastly the south Atlantic States with $6.39 (£1 6*s.* 3½*d.*).

When the servants were hired only for the season the monthly wages were, on average, $1 to $1.50 (4*s.* 1½*d.* to 6*s.* 2*d.*) higher; in the western States in this case they reached in 1909 $21.55 (£4 8*s.* 8*d.*), in the south Atlantic States $8.25 (£1 13*s.* 11*d.*).

As daily wages for female farm hands $0.62, 0.76 and 0.77 (2*s.* 6½*d.*, 3*s.* 1½*d.* and 3*s.* 2*d.*) were paid in the above three years.

The returns showed that the neighbourhood of towns with upwards of 25 000 inhabitants did not have in every State the effect of increasing the rates of wages of female workers, and that this depends more on the special conditions of each State.

In conclusion the writer notes that also in the United Stares work in the household is often considered as a derogatory occupation, and he deplores the disappearance of the so-called home industries in the country.

173 - The First Year of Book-keeping at the Agricultural Institute of Rotholz in Tyrol.

GROFF, L.: Das erste Buchführungsjahr an der landwirtschaftlichen Landesanstalt Rotholz in Tirol. — *Wiener Landwirtschaftliche Zeitung*, 63rd Year, No. 3, pp. 25-26. Wien, January 8, 1913.

The writer proposes to show by the present results of book-keeping how erroneous is the widely spread view that the farm of an educational institution cannot in itself be a profitable undertaking.

The farm of the Institute is of a compact form and includes 242 acres of arable land, 168 acres wooded area, and 617 acres of alpine pasture. Of the arable land 178 acres are rented out, only 64 being farmed by the Institute. Of these 44½ are under lea and forage crops, 12 acres devoted to other crops and 7½ to the nursery and vegetable garden.

The accounts are divided into three groups: 1) field crop accounts, 2) live stock and alpine pasture accounts, 3) technical or accessory industrial branch.

The total expense for the meadows amounted in 1911 to £179 2*s.* 8*d.*, the gross returns to £361 16*s.* 11*d.*, which leaves a net profit of £182 14*s.* 3*d.*, or 16.5 per cent. on the capital. The fairly high yield of 63.7 cwt. of hay per acre from the bad wet meadows of the Institute is due to the dry summer.

The favourable weather allowed the hay to be harvested with a small amount of labour, so that the cost of production, 1*s.* 6*d.* per cwt., is much below the calculated market price of 2*s.* 7½*d.* per cwt. For clover hay the cost of production, owing to the greater amount of work it entails, is much higher: 2*s.* 1*d.* per cwt.

The further calculation of the profits on the field crops is given in the following table.

The cultivation of green maize yielded only 5 per cent. interest, while with vetches the cost of production was much higher than the value of the vetch hay. The field crop accounts show on the whole a net profit of 14.2 per cent. on the capital.

Crops and Area in acres	Expense	Gross returns	Net profit		
	£ s d	£ s d	Total £ s d	Per acre £ s d	Per cent. on capital
Potatoes . . . . . . 4.32 acre	99 10 9	138 8 4 3/4	38 17 7 3/4	8 19 9	21.0
Wheat . . . . 4.64 »	59 8 1½	76 5 4	16 17 2½	3 12 6	8.7
Mangolds . . . . . . 0.79 »	26 19 6¼	35 19 4¼	8 19 10	10 16 10	26.4

The alpine pasture yielded £84 16*s*. 10*d*. against an outlay of £66 16*s*. 3 3/4 *d*., the net profit being thus £18 0*s*. 6¼*d*., or 0.91 per cent. of the capital. In order to improve this result the writer demands that the sum paid for the grazing of stock belonging to outsiders be raised. At present it is only 1.3*d*. per head per day.

In the cattle shed there were in 1911, 45 cows, 1 bull, and 5 heifer and 5 bull calves. The net profits from the cattle amounted to £88 2*s*. 7¼*d*, or 7.4 per cent. on the capital. (Outlay £954 3*s*. 2¼*d*., gross returns £1042 5*s*. 9½*d*). Pig rearing yielded as much as 9.05 per cent. on the capital. The total outlay for draught stock (2 horses, 2 oxen, 1 mule) represents, after deduction of the income derived from manure, increase of value and work done for hire, the value of the work done in the farm. This account therefore shows no net profit.

The dairy gave a net profit of £105 4*s*. 10*d*. or 22 per cent. on the capital. The production of butter and skimmed milk cheese proved more profitable than the direct sale of the milk. The percentage of net profit seems disproportionally high; the reason of this is to be sought in the low valuation of the capital. The total net return of the farm managed by the Institute is 7.24 per cent., and including the accessory industries (dairy, forest and nursery) 7.8 per cent. of the capital.

To these very favourable results in 1911 several factors contributed: the price given to the land: £19 16*s*. 9*d*. per acre, is very low in comparison to present prices. The weather conditions of 1911 were unusually favourable for the property, which has an excessively moist subsoil; and whenever possible expensive human labour was replaced by labour-saving machines. But even giving the land a higher value and allowing for less favourable weather, the interest on the capital engaged in the farm of the Institute will not sink below the normal rate of 4 per cent.

174 – A Cantonal Agricultural Book-keeping Office.

Eine kantonale landwirtschaftliche Buchführungsstelle. Mitteilung der landwirtschaftlichen Gesellschaft des Kantons St. Gallen. — *Schweizerische Landwirtschaftliche Zeitschrift*, Year XL, Part 50, pp. 1164-1165. Zürich, December 13, 1912.

The board of the agricultural society of the Canton of St. Gall resolved on December 2, to institute a cantonal book-keeping office in connection with the agricultural School at Custerhof. The chief object of this office is to awaken the interest of farmers in agricultural accounts and to induce them to practise regular book-keeping. The means employed to attain this end are : courses of instruction and the publication of the results of farming.

AGRICULTURAL INDUSTRIES.

AIRYING

175 – Dairying in Hungary in 1911.

KOERFER, STEPHAN. : Ungarns Milchwirtschaft im Jahre 1911. — *Ausgaben des Königl. ung. Ackerbauministers.* Budapest, 1912.

For the clear representation of the dairying conditions of Hungary an examination of the available date on the numbers of head of cattle and sheep existing in the country is necessary. The following tables, I and II, supply the required figures :

TABLE I. — *Number of Cattle in Hungary.*

Breed of Cattle	In 1895 Head	In 1911 Head	Variation Head	 Per cent.
Hungarian	3 756 137	1 872 790	— 1 883 347	— 51.40
Parti-coloured	347 527	3 590 818	+ 2 243 291	+ 166.40
Gray	158 112	171 867	+ 13 755	+ 8.69
Other breeds	434 664	392 757	— 41 907	— 9.64
Buffaloes	132 578	155 192	+ 22 614	+ 17.05
Total	5 829 018	6 183 424	—	—

TABLE II. — *Number of Sheep in Hungary.*

Breed of sheep	In 1895 Head	In 1911 Head
Merino	7 526 686	2 353 105
Raczka and Cziguja		4 037 345
English mutton sheep		1 306 432
Total	7 526 686	7 696 881

In the census of 1911 the different breeds of cows were returned separately. Altogether there were 2 619 264 head, or 42.35 per cent. of the total number of cattle.

The writer lays down for the cows of each breed a certain average yearly production of milk, and with this basis and the number of cows he calculates the total amounts of milk produced in the country. For Hungarian cows the average yearly yield is 198 gals. For parti-coloured cows 330 gals., gray cows 396 gals., other breeds 264 gals., and buffalo cows 176 gals.

According to the above the production of cow's milk was, in 1911, 760 million gallons, worth about £18 700 000 (calculationg 5.9 *d.* per gallon).

In the year 1911, 3 310 000 (in round numbers) ewes were milked; they amount to 43 per cent. of the total number of sheep. Taking the yearly average at 8.8 gallons of milk perewe, the total production of ewes' milk may be set down at about 29 million gallons, which, at 6.8*d.* per gal., are worth about £820 000.

The value of the total milk production is thus about £19 520 000.

The writer then calculates the cost of production of the milk and comes to the conclusion that the keeping of milch stock is not often profitable to the small farmer. He recommends the institution of milk record associations as a means of raising the production of milk, as the cost of production diminishes (within certain limits) with the greater amount of yield per cow. He reports next upon the Hungarian milk record associations and on milking competitions.

If from the total amount of cows' milk produced, namely 760 million gallons, the quantity consumed by the population be deducted, calculating 26.4 gals. per head (of the 18 300 000 inhabitants) per year, or about 483 million gallons, and the 15 million gallons of fresh milk which are exported, there remain about 262 millions of gallons of cows' milk and 29 million gals. of ewes' milk for dairy purposes.

It is further stated that there are in Hungary about 600 dairy associations; a certain number of them are cooperative, but very small. There are besides two large joint stock companies which make and export butter.

The production of cheese in Hungary is considerable. The chief qualities made are Hungarian Emmental, Trappist, Romadour and Magyarovar cheeses, besides the Liptauer made from ewes' milk.

In a table at the end of his paper the writer gives precise data on the dairy produce exports and imports for the years 1909, 1910 and 1911, according to which the amount of butter exported in 1911 was 60 038 cwt. and that imported 14 292 cwt. As for cheeses only ewes' milk cheese shows an excess of exportation (50 255 cwt.) over the importation (1 856 cwt.). The imports of dessert cheeses are very much above the exports, while of other cheeses the amounts are nearly even.

176 - The Use of the « Gär-Reductase » Test in Conjunction with the Usual Milk Tests as a Basis for the Price of Milk in Cooperative Dairies.

KONRADI, EMIL.: Die Gärreduktaseprobe in Verbindung mit der gewöhnlichen Milchprüfung als Grundlage für die Gütebezahlung der Milch in Genossenschaftsmolkereien. — *Molkerei-Zeitung*; *Berlin*, Nos. 52 and 53, pp. 601-602 and 613-614. Berlin, December 21 and 28, 1912.

The "Gär-reductase" test, according to Orla Jensen, serves to show defects in milk. The Gär tests alone were first used in Switzerland for testing and pricing the milk in cheese factories. The reductase test, which was first employed by Barthel, depends upon the fact that living bacteria have the property of taking up certain colouring matters and excreting in their place colourless matabolism products, whereby the colouring matters introduced into the milk disappear. The rapidity of this process depends on the temperature and the number of bacteria present. If all the samples of milk receive the same amount of colouring matters and are kept at the same temperature, the rate of discoloration depends entirely on the number of the bacteria.

Jensen has combined the two methods. He took a sample of 40cc. from each milk can; to this he added 1 cc. of a methyl-blue solution, made by dissolving one methyl-blue tablet, prepared expressly for this purpose, in 200 cc. of water. The milk samples into which the colouring matter had been introduced were placed in a water-bath, which was kept at the constant temperature of 38° C. The milk should be carefully watched for the first 20 minutes; afterwards it need only be looked at every quarter of an hour.

The milk can be divided into four classes, according to its behaviour during the test.

I. Good milk: the colour is perceptible for 5½ hours or longer. In this case, there are usually half a million bacteria to the cubic centimetre of milk.

II. Average milk: the colour is visible for at least 2 hours; before 5½ hours have elapsed, the discoloration takes place. Number of bacteria per cc. usually from ½ to 4 millions.

III. Bad milk: the colour is apparent for over 20 minutes; before two hours, the colour disappears. Number of bacteria per cc. generally from 4 to 20 millions.

IV. Very bad milk: The colour is perceptible at most for 20 minutes. Bacteria per cc. usually over 20 millions.

As the bacterial flora in the milk samples is apparently unaffected by the colouring-matter absorbed, the various samples are kept at from 38°-40°C. until the next day (20-24 hours); at the end of this time the milk has usually curdled. The appearance of the curdled samples depends upon the bacteria which have gained the upper hand and which were present in the greatest number at the beginning of the experiment. Thus, the samples may be gelatinous, distended by gas, spongy or cheese-like;

and in this way demonstrate the presence of harmful bacteria in the milk (1).

If the results of the "Gär-reductase" test (taking also into consideration the fat content, etc.) is taken as a basis for the price of milk, the question arises whether the normal price should be paid for good milk and a corresponding reduction made in the case of milk of inferior qualities, or whether there should be a fixed price for all milk, with an additional charge at the end of the year for especially good milk. The writer thinks the latter system the best. It offers more encouragement than does price reduction for the production of milk free from defects.

A periodic control of the milk sent to the dairies is therefore to be recommended. The writer mentions some Danish dairies in which such a control is effected (now partly with the assistance of the "Gär-reductase" test) twelve and twenty-six times respectively every year.

MEAT INDUSTRY

177 – Prices of Meat in the Argentine, New York and some European Cities.

1. — MICHELET, JUAN A. Precios de las carnes en la Argentina, y en las principales ciudades europeas. — *Revista de la Asociación rural del Uruguay*, Year XLI, Nos. 9 and 10, pp. 649-656 and 763-766. Montevideo, September and October 1912.

2. — Rapport de M. VINCEY à la Section de l'économie du bétail et de l'industrie laitière de la Société des Agriculteurs de France. — *Bulletin de la Société des Agriculteurs de France*, Year 15, pp. 13-16. Paris, Jan. 1, 1913 (2).

In the *Argentine* the price of meat, which was 2.1 *d* per lb. at the beginning of 1912 reached 3.4 *d* per lb. at the close of the same year. As a comparison the writer gives the prices of meat in other countries, mostly obtained from official publications. A typical case is provided by Great Britain, which consumes the best quality Argentine cattle at a lower price than the non-exportable offals fetch in the producing country.

The Argentine municipalities oblige butchers to sell meat by weight and to exhibit a list of prices; but as a matter of fact the meat is sold by the joint and not by weight, and the consumer pays 30 to 40 per cent. more than the nominal price. The following is the municipal tariff at Buenos Ayres (in pence per lb.):

Surloin	7.7	Chop	2.9
Chuck-steak	3.8	Brisket	2.4
Round	3.8	Shoulder	2.4
Bones	1.4		

Price of meat in New York. — In 1912 the prices of meat were the highest ever known in the United States. In September beef was at 30.3*d* the pound, and it was predicted that before the end of the year it would reach 21.7*d*. Cattle are sold at 15 to 17 *d* per lb. of live-weight. Reckoning bullocks at 59 per cent., the New York prices are lower than the Argentine ones. In Argentine the cold-storage firms pay 11 *d* to 12½ *d* per lb. live-weight.

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(1) The curd should be equally dense, and not stringy, flocculent or interrupted by gas bubbles. See RIEVEL, *Handbuch der Milchkunde*, p. 317. Hannover, 1910. (*Ed.*).

(2) See also: VINCEY et ROLLIN, *Le prix de la viande à Paris*. Paris, Dunot-Pinat, 1912. (*Ed.*).

Price of meat in the United Kingdon. — In 1911 the Argentine furnished 85.5 per cent. of the refrigerated meat imported. The amounts sent to London were too large, so that prices fell and sales were made with 50 per cent. loss. This state of affairs decided the Argentine cold-storage firms to establish, at the beginning of 1912, an agreement by which the exportation of chilled beef was limited to 37 000 quarters per week, distributed equally among the various exporting firms, instead of the 50 000 to 60 000 which were sent in the last few months of 1911. After the conclusion of this agreement, which the writer thinks essential to allow a margin of profit to the Argentine companies, the prices of refrigerated and frozen meat on the London market rose about the middle of 1912.

Live bullocks from U. S. A.,	per head (March 1912)	$ 18 to $ 25
,, ,, ,, Canada,	,, ,, ,, ,,	$ 17 to $ 23
Frozen beef from U. S. A.	,, ,,	5 ½*d.* to 6 ½*d.* per lb.
Argentine beef (May 1912) :		
Hind quarter (chilled)		3*s.* 4*d.* to 4*s.* 4*d.* per stone
Hind quarter (frozen)		2*s.* 9*s.* to 3*s.* 6*d.* ,, ,,
Fore quarter (chilled)		2*s.* 4*d.* to 2*s.* 8*d.* ,, ,,
Fore quarter (frozen)		2*s.* 4*d.* ,, ,,
Frozen Argentine mutton (May 1912)		2*s.* 2*d.* to 2*s.* 7*d.* ,, ,,

Preserved meat (March 1912) :

Corned beef, 1st quality	per case(*)	33*s.*	to 33*s.* 6*d*
,, ,, 2nd quality	,, ,,	27*s.*	to 33*s.*
Boiled beef, 1st quality	,, ,,	21*s.* 6*d.*	to 22*s.*
,, ,, 2nd quality	,, ,,	19*s.* 6*d.*	to 20*s.*
Corned mutton	,, ,,	33*s.*	to 34*s.*
Boiled mutton, 1st quality	,, ,,	28*s.*	to 28*s.* 6*d.*
,, ,, 2nd quality	,, ,,	26*s.*	to 27*s.*

(*) Containing 12 tins of 6 lbs. each.

Price of meat in France (1). — The following tables show the prices at some of the important markets in France :

Prices of meat on the market of La Villette, Paris (2)

Average price in	Bullocks		Cows		Bulls		Calves		Sheep		Pigs	
	Quality		Quality		Quality		Quality		Quality		Quality	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.	pence per lb.
June 1912 . . .	7.8	6.5	7.8	6.5	6.9	6.5	8.8	7.2	10.0	9.1	9.3	8.9
Year 1911 . . .	8.5	7.7	8.5	7.7	7.3	6.9	10.4	9.1	11.3	10.5	9.4	9.1
» 1910 . . .	7.6	7.3	7.6	6.9	6.3	6.1	8.6	7.7	9.5	8.7	7.4	7.2
» 1909 . . .	7.1	6.8	7.1	6.7	6.0	5.9	8.9	8.3	10.1	9 7	6.3	6.1
» 1908 . . .	7.0	6.4	6.8	6.1	5.7	5.4	8.8	8.2	10.0	9.4	7.5	7.3

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(1) See No. 180 below. (*Ed.*).

(2) The wholesale prices of meat at the "Halles Centrales" and those of live stock at the market at La Villette are published monthly in : *Ministère de l'Agriculture, Direction de l'Agriculture, Bulletin mensuel de l'Office de Renseignements agricoles*, Paris. (*Ed.*).

Mean retail prices in Paris, 1912.

Bullocks and Cows		**Sheep**		**Calves**	
Chuck-steak	1*s*. to 1*s*. 3*d*. per lb.	Breast	6*d*. to 7*d*. per lb.	Breast	10½*d*. to 1*s*. per lb.
Rib	9*d*. to 1*s*. 1½*d*. ,,	Shoulder	9*d*. to 10½*d*. ,, ,,	Loin	11¼*d*. to 1*s*. 0¾*d*.
Loin	1*s*. 1½*d*. to 1*s*. 6*d*.	Leg	11¼*d*. to 1*s*. 0½*d*.		
Round	1*s*. 4*d*. ,, ,,				
Brisket	10½*d*. ,, ,,				

Prices of live stock at Bayonne.

Butcher's bullocks	3½*d*. per lb. live-weight.
Draught oxen	£24 to £32 the pair.
Cows	£18 to £26 ,, ,,
Milk fed calves	5½*d*. per lb. live-weight.
Sheep	4½*d*. ,, ,, ,,
Pigs	6½*d*. ,, ,, ,,

During the last ten years, the French exports of horses, cattle and pigs and fresh meat have been steadily gaining on the corresponding imports. The only exceptions were the years 1907 and 1901, during which the imports of live pigs and fresh meat were again larger. On the other hand, for salt and smoked meat the imports have always exceeded the exports. Since the end of last century the prices of meat in France have been going steadily up. At the end of spring in 1911 they were 25 per cent. above the means of the years 1901 to 1910. These very high prices of the first half of 1911 resulted in an annual diminution of the consumption of meat in Paris equal to one-twentieth of the total consumption in 1910.

The retail butchers and pork-butchers generally sell at about 1½ *d* or 1¾ *d* per lb. dearer than they buy, wholesale or semi-wholesale, at the municipal shambles at the "Halles Centrales" and in the provision markets. This raising of price from the wholesale or semi-wholesale means about 1¼ *d* for general expenses and ¼ *d* or ½ *d* for profit. Thus in the price paid by the Parisian consumer, the wholesale price accounts for 85 per cent. and the retailer's handling for 15 per cent., namely 12 per cent. general expenses and 3 per cent. profit. On the money returns of all sales, both meat and bye-products of the total of butchers and pork-butchers' beasts, the country provider gets approximately 76 per cent. For expenses and profits the remaining 24 per cent. are thus distributed among the intermediaries: 2 per cent. to the railway companies, 1 per cent. to the auctioneers, 5 per cent. to the city of Paris, 3 per cent. to the wholesale butchers and pork butchers, and 13 per cent. to the retailers; this is reckoning all sorts and qualities, and an average distance from Paris.

Price of meat in Sweden.

Bullocks and cows	3*d*. to 4¾*d*. per lb.
Sheep for slaughter	4½*d*. to 5¼*d*.
Suet	3⅛*d*.

Price of meat in Belgium.

Year	1880	1890	1895	1900	1905	1910	1911
Bullocks and cows pence per lb.	6.9	6.7	6.75	6.7	7.25	7.8	8.7
Pigs ,, ,, ,,	7.8	6.25	4.4	4.8	6.1	7.1	7.4

Average prices in the first half of 1912.:

	Live cattle pence per lb.	Meat wholesale pence per lb.
Native bullocks	4.3 - 5.4	7.4 - 9.75
Bullocks from U. S. A.	3.9 - 4.8	6.5 - 8.2
Dutch bullocks	4.8 - 5.4	7.6 - 9.5
French bullocks	4.8 - 5.2	7.4 - 9.5
Calves	4.8 - 6.3	8.7 - 13.0
Pigs	4.8 - 6.1	7.4 - 9.5

The eating of horse-meat has developed greatly in Belgium : in the slaughter-houses at Brussels and Cureghem-Anderlecht the number of horses slaughtered has increased from 1847 to 3809 in the last five years. In 1908, 16 099 horses for slaughtering were imported into Belgium, valued by the customs at £3 11*s* per head. At present the horses for slaughter (mostly from Great Britain) fetch £6 to £12 for a weight of 660 to 880 lbs. The consumer pays 3 ½*d* to 5*d* per lb. for horse-meat as steaks, 3*d* to 5*d* for scrap.

Price of meat in Spain — The exportation of live beasts from the Argentine to Malaga and Barcelona has given good results. At Barcelona the bullocks sold at 6½*d* to 6 ¾ *d* per lb. of meat (weight of the quarters) and the sheep at 6½*d*. Small beasts are preferred ; bullocks should not exceed 550 lbs. (weight of the quarters) or sheep 42 lbs. The bullocks consumed in Spain are mostly of good quality, especially the rather small native ones weighing 300 to 400 lbs. The larger imported bullocks, weighing 600 to 800 lbs., are fatter and less choice. Slanghtering calves under 130 lbs. in weight is prohibited.

Sale prices of meat in Spain.

	Bullocks	Calves	Sheep	Grass Lambs	Milk Lambs	Sheep	Pigs
Pence per lb.	6.4-7.5	8.75	6.9-7.6	6.5	8.75(*)	6.5	5.6-7.8

(*) Milk lambs are generally sold by head.

Retail prices of meat.

		per lb.		per lb.
Bullocks :			**Milk kids and lanbs :**	
1st quality :	under cut	1*s*. 6*d*.	1st quality	10½*d*.
1st quality	without bones	11¼*d*.	2nd quality with bones	8¾*d*.
,, ,,	with bones	7¾*d*.	**Sheep :**	
2nd quality	without bones	9½*d*.	1st quality	10½*d*.
,, ,,	with bones	7¼*d*.		
Calves :			**Pigs :**	
1st quality	without bones	1*s*. 6*d*.	Loin without bones	10¼*d*. to 1*s*. 1*d*.
2nd ,,	without bones	11¼*d*.	,, with bones	8½*d*. to 9½*d*.
3rd ,,	with bones	10¾*d*.		

Prices of green hides.

	Pence per lb.
Bullock hide	6.3
Calfskin	7.4
Sheepskin	6.7
Lambskin	7.6

Price of Argentine meat in Austria.

	Pence per lb.
Price of frozen meat in the Argentine	2.3
Shipping from Buenos-Ayres to London	0.36
Shipping from London to Trieste	0.23
Austrian customs duty	1.4
Carriage from Trieste to Vienna	0.14
Expenses of unloading, etc.	0.05
Cost of 1 lb. of frozen meat delivered in Vienna	4.5

Argentine meat, at the depot, with 10 per cent. waste:

Fore quarters, per cwt.	30*s.*
Hind quarters, ,, ,,	35*s.*

Price of meat in Italy.

Retail prices.

	Fore quarter with bones pence per lb.	Hind quarter with bones pence per lb.	Meat without bones pence per lb.
Bullocks or Cows:			
Rome	7.8-8.2	8.7-9.8	11.3-15.6
Genoa	7.8	7.8	12.1-13.0
Bologna	7.8	10.0	13.0
Florence	6.5-7.2	9.8	11.7-16.0
Venice	8.2	10.0	12.1
Calves:			
Rome	7.8-12.0	15.2-16.2	13.4-15.2
Genoa	10.8	10.8	17.3-21.7
Bologna	10.8	10.8	21.7
Florence	6.5-8.5	12.6-13.4	15.6

Cost of Argentine meat at Genoa.

	Pence per lb.	For shipments of over 1000 tons. pence per lb.
Meat on board at Buenos Ayres	2.39	2.17
Shipping to Genoa	0.87	0.35
Insurance	0.02	0.02
Customs duty at Genoa	0.61	0.61
Expenses of unloading, etc.	0.35	0.70
Total	4.24	3.85

Cost of Argentine meat at Rome.

	Pence per lb.
Cost at Genoa	4.24
Railway carriage from Genoa to Rome	0.26
Municipal dues	0.82
Slaughterhouse dues	0.07
Carting in Rome	0.04
Depot: say 30 days in cold store	0.43
Distribution to butchers' shops, other expenses	0.22
Loss, deterioration and interest on capital	0.22
Total . . .	6.30

Price of Argentine Cattle in Switzerland.

Cost of importing a bullock to Berne or Lausanne.

	£	s	d
Shipping from Buenos Ayres to Genoa	5	7	0
Feeding	2	0	0
Expenses of unloading		5	6
Carriage from Genoa to Lausanne or Berne	1	5	6
Customs duties	1	5	6
Various expenses		7	0
Total . . .	£10	10	6

The above figures refer to beasts which gave 715 lbs. of meat on slaughtering; this was sold at nearly 8½ *d* per lb. *i e.* £25 2*s*; deducting the expenses, there remains £14 11*s* 6*d* for the price of the beast at Buenos Ayres.

178 – Importation of Cattle and Meat from the Argentine to Italy.

1. ZABALA, ROMULO. Importación de ganado y carnes argentinas al Reino de Italia. — *Republica Argentina, Boletin del Ministerio de Relaciones Exteriores y Culto,* Vol. XXXVI, No. 1, pp. 127-139. Buenos Aires, 1912.

2. ACEVEDO, EDUARDO. Exportación de ganado á Italia. — *Revista de la Asociación rural del Uruguay,* Year XLI, No. 9, pp. 691-696. Montevideo, September 1912.

1. — Italy holds the first place among European countries as an importer of Argentine cattle, and is second only to Belgium as an importer of sheep. The sale of Argentine beasts and meat is spreading all over Italy; but at present it is of most importance in Liguria, Piedmont and Lombardy. Tuscany is furnished from the port of Leghorn, to which the beasts are reshipped from Genoa; the writer considers that this reshipping might be avoided, and that Leghorn is a sufficiently important centre of importation to have a direct service. The cost of reshipping from Genoa to Leghorn is 7 *s* 6 *d* per head for cows and bullocks and 14 *s* for bulls, plus 5 per cent. for the captain of the ship.

Italian customs duties on live cattle.

Bullocks	30 *s*
Bulls	14 *s* 3 *d*
Cows	[illegible]
Calves	6 *s* 3 *d*

Current prices for live Argentine cattle delivered in Leghorn.

	per cwt.
Steer calves	36 *s*
Bullocks of 30 months, of at least 6 cwt.	40 *s*
» from 5 months to one year. . .	40 to 44 *s*
Cows and heifer calves.	32 to 36 *s*

2. — In 1911 the imporation from the Argentine to the port of Genoa was 33 846 steers, 12 428 wethers and 4 750 tons of frozen meat. The mortality on board in the early part of the year was 6 to 10 per cent., but later it fell to 2 per cent owing to improvement in the conditions. The tariff varied between £ 4 and £ 5 12 *s* per head, and rose temporarily even higher than the latter figure. Insurance *f. a. p.* (against extraordinary losses) costs 1 per cent; *c. a. p.* insurance (for ordinary mortality) is not undertaken by Italian companies, but English ones undertake it at various prices (such as 6 per cent., with 2 per cent. returned if no claims are made). Insurance is reckoned on a basis of £ 13 17 *s* 6 *d* to £ 15 17 *s* 6 *d* per head. The average price for live beasts at Genoa is 34 *s* per cwt.; or after the customs duty is paid 38 *s*. In the meat-marts at Genoa the price of beef is about £ 4 per cwt. for Italian and French, and about £ 3 8 *s* for Argentine.

179 - The Dead Meat Trade.

ROULSTON, O. W. H. in *The Department of Agriculture and Technical Instruction for Ireland: Journal*, Vol. XIII, No. 1, pp. 27-36. Dublin, October 1912.

The value of the meat consumed in England between the years 1856 and 1862 was 2*s*. 6*d*. per inhabitant per year, while in the period 1905-1911 it rose to 21*s*. 7*d*. The value of the meat imported during these two periods rose from £3 584 000 to £48 042 000. While in 1897 the amount of living cattle imported, namely 4 000 000 cwts. exceeded by much the quantity of beef imported (3 500 000 cwts.), in 1911 the former sank to 1 300 000 cwts. and the latter rose to 8 000 000 cwts. A similar change took place with mutton.

These variations are due principally to two causes. The exportation of living animals is always liable to interruption by the outbreak of some disease leading to the prohibition of imports by other countries. Consequently, when the introduction of dead meat has once begun no one cares to go back to the exportation of living animals. The second reason is that the cost of transport of dead meat, both by rail and by ship, is considerably inferior to that of living animals. Besides which there is the advantage that with the dead meat trade other industries can be connected, such as converting some of the offal into useful food stuffs, leather tanning, the manufacture of soap, margarine, glue, horn combs, fertilizers, etc. All these reasons contribute to give the dead meat trade a broad and firm basis in the Smithfield market.

The buildings of this, the greatest meat market in the world, cover an area of about 10 acres, and include 344 butchers' shops with a staff of about 5000 persons. The amount of meat it dealt with in 1907 was 419 037 tons and in 1911, 435 316 tons. Of this mass of meat 77.2 per cent. came from the colonies and from abroad, of which 80 per cent. was imported in cold storage. Argentina provides the greatest quantity of beef, whilst New Zealand is the greatest purveyor of mutton, though Australia sends nearly as much. The United States and Denmark hold the first place as providers of bacon and hams, while Holland supplies the greatest quantity (80 per cent.) of fresh pork. In the United Kingdom itself for a long time past Scotland has forwarded the best qualities of beef and mutton. In particular, Aberdeen sends to Smithfield, in specially built railway cars, great quantities of meat, which command the highest prices.

In Holland the slaughter houses which kill pigs for exportation are situated as near as possible to the ports. The dead pigs are hung in rows on hooks in heavy cases and so carried by rail or ship. To every slaughter house veterinary surgeons are appointed by the Government to examine the meat as to its fitness. The offal is also sent to London. The writer has visited several large slaughterhouses in Holland which can deal with 2000 to 3000 pigs per day. He believes that Ireland also could sucessfully export fresh pork and mutton to England if the same measures as are current in Holland were adopted.

Though the trade in live stock between Ireland and England presents some advantages, such as the short distance for sea transit from port to port, and the formed connection between shipper and consumer, on the other hand greater advantages are offered by the dead meat trade, namely:

1. — Its special value at periods of disease outbreak, when the live stock trade is temporarily stopped.

2. — The avoidance of the loss of weight and deterioration in quality inevitable to the live system.

3. — The higher price commanded by really prime finished meat at Smithfield as proved by practical tests.

4. — The educational effect of a dead meat business on the Irish feeder, by showing him the profit to be realised by rearing and feeding cattle of the best quality and finishing them well.

5. — The probability that a trade that has been found profitable by Scotch feeders, who finish largely Irish stores, would be still more so to Irish farmers who produce the stores themselves.

6. — The establishment of subsidiary industries that would be rendered possible by the dead meat trade and would offer a considerable amount of employment.

The hides of cattle slaughtered in Ireland are either worked up in the Irish tanneries or exported chiefly to Liverpool, Manchester and Glasgow by English firms and brokers. A large proportion of the Irish hides are ultimately sent to America.

The fat is utilized to a certain extent in Ireland, but only for the manufacture of soap, while in Hamburg for instance the fat is refined and graded into three qualities for the production of margarine, lard and machine oil, and thus more profitably disposed of. The blood also in Hamburg is used for the preparation of sausages, molasses feeds, and manure, while in Ireland (with the exception of Dublin) it is thrown onto the manure heap.

In Ireland the heads, tails, tongues, hearts and livers are sold for soup and broth making, while in marketing centres they command much higher prices.

The average price paid for the offal of prime beef in the London market is 50*s*. In the year 1908 Ireland shipped to English and Scotch ports 862 634 head of cattle and 183 485 head were killed for home consumption. Taking the value of the offal at £2 10*s*. per head, the value of the raw material supplied to the United Kingdom equals over £200 000. In the same year 725 557 sheep were exported, and the offal value of these taken at 8*s*. each would represent an additional £290 000. There can be little doubt that, if these offals could be retained and worked up in Ireland, it would considerably enhance the present value of the cattle rearing industry to the country.

180 - The Sale of Cattle for the Butcher and the La Villette Market.

ROLLIN.: La vente du bétail de boucherie et le marché de la Villette. — *Bulletin des séances de la Société nationale d'Agriculture de France*, Vol. 72, No. 8, pp. 756-763. Paris, 1912.

The market of La Villette serves as a centre for the sale of cattle for the butcher and of meat for the supply of Paris, as it is situated at the junction of the railway-lines connecting the cattle-raising districts of Central and Western France with North and East France, where this industry is little practised. It is thus the meeting-ground for buyers and sellers from a large tract of country. On account of the size of the latter, the supply and demand are always equal. The market is open to all who wish to buy or sell cattle. Thus the small proprietors can arrange among themselves and send one of their number to La Villette to sell their cattle, if they do not care to entrust the matter to a middleman.

The writer gives details of the arrangements and selling-methods of the market and mentions the changes in prices. From 1899 to 1910, the price of meat rose, on account of the increased demand for this article of diet, the general increase in the production cost and the demand from abroad. In 1911, the price again rose, but without in any way benefiting the producer, for the return from cattle was very little owing to the protracted drought and a renewed outbreak of foot-and-mouth disease. The La Villette market thus affords a gage of the condition of cattle breeding.

It has been alleged, that the market by its cattle trade promoted the spread of the foot-and-mouth disease. The sending of cattle there was for a time forbidden, but this prohibition was soon cancelled, owing to its bad effect on the cattle trade and its inefficiency from a prophylactic standpoint.

It was then proposed to build slaughterhouses in the centres of production and to have cattle markets attached where the animals were to be sold. These markets, however, proved disastrous for the senders, who were obliged to sell their animals for any price which was offered. Soon, however, the slaughterhouses became the property of large Joint Stock Companies, which by the formation of trusts, were enabled to enforce whatever prices they chose on the producer and the consumer. Thus, the price of meat did not go down. The middlemen of the La Villette market were only replaced by the agents of the Slaughterhouse Societies. Also the transport costs were not diminished, for the slaughterhouses were obliged to get their cattle from a distance of 30 to 60 miles or more, and further, the danger of spreading foot-and-mouth disease remained the same.

It was therefore best to improve the existing markets in the large towns and especially that of La Villette. In order to accomplish the latter purpose, it is necessary to rebuild and enlarge the railway-station and provide the slaughterhouses and market with their own sidings for loading cattle. The slaughterhouses must be better equipped with disinfecting appliances and have more cold-storage chambers.

If the conditions and means of transport were improved, and the police-regulations regarding foot-and-mouth disease extended, this important question, which is so much occupying the minds of agricultural organisers, would soon be solved.

VINE-MAKING

181 - The Making and Composition of Tunisian Wines.

MARCILLE, R.: La Vinification et la Composition des Vins de Tunisie. — *Bulletin trimestriel de la Direction Générale de l'Agriculture,* Year 16, No. 63, pp. 128-149. Tunis, Second Quarter, 1912.

In the first part of his paper, the writer gives an account of the different processes of wine-making: he treats of the use of sulphurous acid, the products which are utilized, the determination of sulphurous acid, the changes which it undergoes, and its relation to alcoholic fermentation; and finally he suggests clarifying the must by centrifugal force. M. Marcelle has himself made some preliminary experiments in this direction, using small dairy separators. These experiments, although imperfect, seem of interest, for they allow of its being concluded that large industrial machines would furnish musts containing in suspension only pectic matters together with fine cellulose particles from the pulp.

In spite of the violent agitation which the liquids undergo on leaving the apparatus, the loss of the free sulphurous acid of the musts is relatively very small. On the other hand, the musts to be submitted to centrifugal action should only receive small quantities of sulphurous acid, since the economy of the process consists precisely in permitting these liquids to ferment immediately after purification through passing into the turbine.

The second part of the article in question treats of the composition of Tunisian wines, and shows that certain characteristics which they possess cause these natural products to fall under the suspicion of having been adulterated. Numerous tables of analyses and statistics of results obtained in the Laboratory of Agricultural Chemistry in Tunis give the facts on which the writer has based his opinion ; the latter is of the more value as he gives information and arguments, of which we reproduce the most important.

The Tunisian vineyard differs not only from the French, but also from those of the Departments of Algiers and Constantine. In the latter countries, the vine is usually planted on rich plains, where the rainfall exceeds 600 mm. (24 in.) and the vintage is often more than 880 gallons per acre. In Tunis, nine-tenths of the plantations are situated in districts with a rainfall of less than 450 mm. (18 in.), and the average yield of the vines in bearing is only 260 gallons. From these differences there arise variations in the composition of the wines, all the more so as the local climatic conditions produce differences in the physiological processes of ripening. The functions of the grapes are often hindered by the scorching of the organs which supply them with acids. Consequently, owing to the effect of the long dry summers, and especially when heat waves occur before the period of maturity, a must is produced which is poor in sugar, and the wine has a low alcohol content and at the same time is very deficient in acid.

These accidents are of annual occurrence in most of the vineyards. If it is true that certain stocks like Aramon, Monrastel, and Carignan are especially affected, yet cases of the same kind occur in the crop of a whole district. This for example was observed in the vintage of 1911.

Other important differences may be mentioned, showing that the rules of Blarez and Halphen cannot well be applied to Tunisian wines. The ripening of grapes, of which the synthetic activity appears to increase under the influence of intense insolation, differs in its progress from what has been observed in France. From the time of the grapes turning colour, the acid cannot accumulate in the fruit and when the ripening occurs steadily the alcohol content of the wines increases with their acidity. The composition even of the musts must also differ, for the addition of several grams of acid sometimes makes very little difference in the wine. In an experiment made at the Colonial School of Agriculture at Tunis the addition of 2.75 gr. of citric acid had increased the final amount of fixed acid in the wine from 0.3 to 0.4, and 3 gr. of tartaric acid to 0.7. This shows how arbitrary it would be to try and judge of the watering by subtracting the added acid from the acidity of the wines.

On the other hand, the statistics of the analytical results show that of 445 samples examined during the last five years, 27 per cent. of the Tunisian red wines and 40 per cent. of the white deviated by more than 0.3° from Halphen's rule and by 15.9 and 28.5 from that of Blarez. These samples came exclusively from well-known proprietors.

The wines from young vines give very low figures as regards alcohol content, acidity and the amount of dry substances present ; on the other hand, some grapes like Alicante, Ugni, and Chasselas are rich in alcohol, but often poor in extracted matter.

The presence of free tartaric acid has been detected in white and pink wines to which citric acid has not been added ; the red vintages of 1910 and 1911, however, show no trace of it.

The great majority of Tunisian wines, from different sources both as to vine and origin, give a dextro-rotary deviation ; the reverse is the case with French wines.

Normal boric acid occurs in Tunisian wine in the proportions of from 10 to 35 mgr. per litre ; and manganese was present in one sample in the exceptional amount of 20 mgr. ; this same sample contained 256 mgr. of iron. According to the writer, this might give a means of distinguishing normal from added manganese.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

182 - **The National Quarantine Law of the United States of America and Regulations.**

1. National Quarantine Law. An Act to regulate the importation of nursery stock, and other plants and plant products; to enable the Secretary of Agriculture to establish and maintin quarantine districts for plant diseases and insect pests; to permit and regulate the movement of fruits, plants, and vegetables therefrom, and for other purposes. -- *The Monthly Bulletin of State Commission of Horticulture*, Vol. I, No. 10, pp. 791-795. Sacramento, California, September 1912.

2. *U. S. Department of Agriculture, Office of the Secretary, Federal Horticultural Board, Circular* No. 41 (Revised). Washington, December 20, 1912.

3. *U. S. Department of Agriculture, Office of the Secretary, Federal Horticultural Board, Notice of Quarantine.* No. 1, Washington, September 19, 1912.

4. *Notice of Quarantine* No. 2 (Domestic), September 28, 1912.

5. *Notice of Quarantine* No. 3 (Foreign), September 28, 1912.

6. *Notice of Quarantine* No. 4 (Domestic), November 13, 1912.

Sec. 1. -- It shall be unlawful for any person to import or offer for entry into the United States any nursery stock unless and until a permit shall have been issued therefor by the Secretary of Agriculture, under such conditions and regulations as the said Secretary of Agriculture may prescribe, and unless such nursery stock shall be accompanied by a certificate of inspection, in manner and form as required by the Secretary of Agriculture, of the proper official of the country from which the importation is made, to the effect that the stock has been thoroughly inspected and is believed to be free from injurious plant diseases and insect pests; the Secretary of Agriculture shall issue the permit for any particular importation of nursery stock when the conditions and regulations as prescribed in this act shall have been complied with; nursery stock may be imported for experimental or scientific purposes by the Department of Agriculture upon such conditions and under such regulations as the said Secretary of Agriculture may prescribe; and further, that nursery stock imported from countries where no official system of inspection for such stock is maintained may be admitted upon such conditions and under such regulations as the Secretary of Agriculture may prescribe.

Sec. 2. — It shall be the duty of the Secretary of the Treasury promptly to notify the Secretary of Agriculture of the arrival of any nursery stock at port of entry; the person receiving such stock at port of entry shall, immediately upon entry and before such stock is delivered for shipment or removed from the port of entry, advise the Secretary of Agriculture or, at his direction, the proper State, territorial, or district official of the State or territory or the district to which such nursery is destined, or both, as the Secretary of Agriculture may elect, of the name and address of the consignee, the nature and quantity of the stock it is proposed to ship, and the country and locality where the same was grown. The same formalities are required for the transport from one State to another of the United States of any imported nursery stock, unless and until such imported stock has been inspected by the proper official.

Secs. 3 and 4. — The packages containing nursery stock shall be plainly and correctly marked to show the general nature and quantity of the contents, the country and locality where the same was grown, the name and address of the person shipping or forwarding the same, and the name and address of the consignee.

The same formalities are necessary for the transport from one State or territory or district of the United States into any other State or territory or district of any such imported nursery stock, unless it has been inspected by the proper official.

Sec. 5. — Whenever the Secretary of Agriculture shall determine that the unrestricted importation of any plants, fruits, vegetables, roots, bulbs, seeds, or other plant products not included by the term "nursery stock" as defined in section six of this Act may result in the entry into the United States or any of its territories or districts of injurious plant diseases or insect pests, he shall promulgate his determination, specifying the class of plants and plant products the importation of which shall be restricted and the country and locality where they are grown, and thereafter, and until such promulgation is withdrawn, such plants and plant products shall be subject to all the provisions of the foregoing sections of this Act; provided, that before the Secretary of Agriculture shall issue such promulgation, he shall, after due notice, give a public hearing, at which any interested party may appear and be heard, either in person or by attorney.

Sec. 6. — The term "nursery stock" shall include all field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plants and plant products for propagation, except field, vegetable, and flower seeds, bedding plants, and other herbaceous plants, bulbs, and roots.

Sec. 7. — Whenever, in order to prevent the introduction into the United States of any tree, plant, or fruit disease or of any injurious insect, new to or not theretofore widely prevalent or distributed within and throughout the United States, the Secretary of Agriculture shall determine that it is necessary to forbid the importation into the United States of any class of nursery stock or of any other class of plants or plant products, and notwithstanding that such class of plants or plant products be accompanied by a certificate of inspection from the country of importation, before the Secretary of Agriculture shall issue such promulgation, he shall, after due notice to interested parties, give a public hearing, at which any interested party may appear and be heard, either in person or by attorney; provided further, that the quarantine provisions of this section, as applying to the white-pine blister rust (*Peridermium strobi*), potato wart(*Chrysophlyctis endobiotica* = *Synchytrium endobioticum*), and the Mediterranean fruit fly (*Ceratitis capitata*), shall become and be effective upon the passage of this Act.

Sec. 8. — The Secretary of Agriculture is authorized to quarantine any State, territory, or district of the United States, when he shall determine the fact that a dangerous plant disease or insect infestation, new to or not theretofore widely prevalent or distributed within and throughout the United States, exists in such State, territory or district; notice of such quarantine shall be given to interested parties and to the press. The quarantined State or territory or district shall not export plants or parts of plants unless they shall have conformed to the provisions taken in this connection by the Secretary of Agriculture and which refer to the inspection, disinfection, certification, and method and manner of delivery and shipment of the class of goods; provided, that before the Secretary of Agriculture shall promulgate that it is necessary to quarantine any State, territory, or district, he shall, after due notice, give a public hearing at which any interested party may appear and be heard, either in person or by attorney.

Sec. 9. — The Secretary of Agriculture shall make and promulgate such rules and regulations as may be necessary for carrying out the purposes of this Act.

Sections 10 and 11 establish the penalties incurred by offenders against this Act. They consist of fines not exceeding $500 (about £100) and of terms of imprisonment not exceeding one year.

Sec. 12 appoints a Federal Horticultural Board for the purpose of carrying out the provisions of this Act.

Sec. 13 appropriates the sum of $25 000 (about £5000) for the purposes and objects of this Act.

Sec. 14. — This Act shall become and be effective from and after the first day of October, nineteen hundred and twelve.

2* — The following Regulations concerning the importation of nursery stock were made by the Secretary of Agriculture of the United States on September 18th, 1912.

Definition. — See Section 6 of the said law. Furthermore, "All woody plants and parts thereof for propagation or planting are included within the term 'nursery stock.'"

Permits for Importation. — Persons wishing to import nursery stock must apply to the Secretary of Agriculture for a permit, stating the general nature and quantity of the nursery stock, the State, district or locality where grown, the name and address of the exporter, together with the name and address of the importer in the United States and the proposed port of entry. Applications for permits should be made in advance of the shipment of the nursery stock, but if, through no fault of the importer, stock shall arrive before the issue of a permit, the stock will be held in customs custody at the risk and expense of the importer for a period not exceeding ten days, pending the issue of a permit.

On approval by the Secretary of Agriculture of an application for the importation of nursery stock from countries which mantain nursery stock inspection, a permit will be issued. Permits will expire on the 30th day of June of the year following the date of issue.

Entry of Nursery Stock. — Entry of nursery stock will not be allowed unless accompained by a certificate issued by a duly authorised official of the country from which it is shipped, stating that it has been thoroughly inspected by him, and was found to be free from injurious plant diseases and insect pests. In the case of stock to be shipped between October 1st and May 31st this inspection must be made on or after October 1st, and for stock shipped during the growing season inspection must be made not more than 30 days prior to date of shipment. Until July 31st, 1913, however, the usual inspection certificate covering the previous growing season will be accepted. When the country from which any nursery stock is shipped maintains no official inspection, articles for which a permit has been issued will be admitted only through the ports of New York, San Francisco, Seattle, Jacksonville and New Orleans, after examination by inspectors of the Department of Agriculture at the port of arrival, if found to be free from plant diseases and insect pests.

Nursery stock, if found infected, may be treated or destroyed, as circumstances require.

Foreign Certificate of Inspection. — Certificates of inspection will be accepted if countersigned by duly authorised officials of foreign countries or their agents. On and after July 1st, 1912, certificates must give the date of inspection, name of the grower, the district or locality and country where grown, a statement that the stock has been inspected by a duly authorised official, and been found, or believed to be, free from dangerous insects and plant diseases, and must bear the name of the responsible inspection official for the country of origin.

Declaration. — On and after December 1st, 1912, all shipments of nursery stock to the United States from countries which maintain an official system of nursery stock inspection must be accompanied by a declaration of the shipper, produced before an American consular officer. The declaration must contain a statement by the shipper that he believes the nursery stock to contain no injurious plant diseases or insect pests, the district or locality and country where grown, the name of the grower, the port of origin, and destination of the consignment, the date of inspection of the stock, and the name of the inspector, and the number of the permit issued by the Secretary of Agriculture.

On and after December 1st, 1912, consular invoices covering shipments of nursery stock to the United States must bear the number of the permit issued by the Secretary of Agriculture, and have attached to them the shipper's declaration.

3* — Notice No. 1 prohibits the importation into the United States from Great Britain, France, Belgium, Holland, Denmark, Norway, Sweden, Russia, Germany, Austria, Switzerland and Italy, until further notice, of the following species and their horticultural varieties, *viz.*, white pine (*Pinus strobus* L.), western white pine (*Pinus monticola* Dougl.), sugar pine (*Pinus lambertiana* Dougl.), and stone or cembrian pine (*Pinus cembra* L.). The object of this prohibition is to prevent the introduction into the United States of the tree disease known as " white pine blister rust " (*Peridermium Strobi* Kleb.).

4* — Notice No. 2 prohibits the movement from the Territory of Hawaii into any other State of the United States of America of Alligator pears, Carambolas, Chinese inkberry, Chinese orange, Chinese plums, Coffee berries, Damson plums, Eugenias, Figs, Grapes, Grapefruit, Green peppers, Guavas, Kamani seeds, Kumquats, Limes, Loquats, Mangos, Mock orange, Mountain apple, Natal or Kaffir plum, Oranges, Papaya, Peaches, Persimons, Prickley pears, Rose apple, Star apple, String beans, and Tomatoes. The object of this prohibition is to prevent the introduction into other States of the Mediterranean Fruit Fly (*Ceratitis capitata*), which is new to and not widely prevalent in the United States.

5* — Notice No. 3 prohibits the importation into the United States, until further notice, of the common or Irish potato (*Solanum tuberosum*) from Newfoundland, the islands of St. Pierre and Miquelon, Great Britain and Ireland, Germany and Austria-Hungary, where the disease known as potato wart, potato canker, black scab, etc. (*Chrysophlyctis endobiotica* Schilb., = *Synchytrium endobioticum* (Schilb.) Perc.) is declared to exist.

6* — Notice No. 4 quarantines the States of Maine, New Hampshire, Massachusetts and Rhode Island for Gipsy Moth (*Porthetria dispar*) and the States of Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island for Brown-Tail Moth (*Euproctis chrysorrhoea*).

The interstate movement of 1) coniferous trees, such as spruce fir, hemlock, pine, juniper (cedar) and arbor-vitæ (white cedar) and parts thereof, and decorative plants, such as holly and laurel, and 2) forest plant products, including logs, tan bark, posts, poles, railroad ties, cordwood and lumber, and field-grown florist's stock, trees, shrubs, vines, cuttings and other plants and plant products for planting and propagation, excepting buds, fruit pits, seeds of fruit and ornamental trees and shrubs, field, vegetable and flower seeds, bedding plants and other herbaceous plants and roots, from the quarantined areas is prohibited until plants and plant products have been inspected by the U. S. Department of Agriculture and pronounced free from the said insect pests.

183 – The Congress of the "Defensa Agricola" at Montevideo (Uruguay) in April 1913.

Communication from the Director of the "Defensa Agricola" of Montevideo to the International Institute of Agriculture.

Owing to the initiative of the "Ministerio de Industrias" the Congress of the "Defensa Agricola" will be held at Montevideo in April 1913. Argentina, Paraguay, Brazil and Chile have been invited to send delegates.

The following are the subjects proposed for discussion:

a) The control of locusts.

1. Given the present knowledge respecting the permanent and subpermanent zones where locusts occur, is collective international action possible in these districts?

2. The contribution of each State for the purpose of ascertaining whether there exist in their respective territories centres of distribution of locusts.

3. The form which co-operative international action against such centres could take, should such action appear desirable.

4. The proportion and the manner in which each State could participate in such action.

5. Is it best to adopt an official scheme of a permanent character, or to treat each case as it occurs and in the manner which seems most suitable?

6. Measures for ascertaining the existence of other species of migratory locusts, besides *Schistocerca paranensis*, against which it is neceesary to generalize the international measures of control. The information already in the possession of the Congress and any further data which are communicated respecting the existence of any at present undetermined species in the districts of South, North and West Brazil, in the States of Rio Janeiro, Paraná, Matto-Grosso, Parayba and Rio Grande di Norte. The manner of completing the investigations on this point.

7. The methods of controlling locusts practised in different countries and especially in those represented at the Congress. Methods of destruction: mechanical, physical (fire) and toxic. Biological agents. The utility of communicating generally the methods and systems of destruction in the case of auxiliary, or collective intervention, or of co-operative work for the destruction of the pests, especially in neighbouring countries.

b) Auxiliary telegraphic assistance.

8. The institution of an international telegraphic service, using the same code, for daily information respecting the condition and movements of the locusts.

9. The advisability of extending this service, and using it also for other purposes, such as for giving information concerning other agricultural pests.

10. Places which might serve as centres of information and where

bureaus entrusted with the regular transmission of news could be established.

11. The installation of a central service deputed to receive all data and to compile a demonstration table showing the various phases of the invasion, with indications as to the frequency of the flight of the insects, their numbers, the distance they fly, their retrogression, etc.

12. Could meteorological observations for each country be included in this service?

c) The control of other agricultural pests.

13. The advisability of devising a scheme of control for all the other pests which attack the crops. The measures adopted in each country and the results obtained.

14. The adoption of a uniform system in the service of the inspection of imported vegetable products, with the view of making more stringent the conditions of obtaining certificates of origin.

15. The advisibility of maintaining constant intercourse between the governments of the adhering countries and the methods of attaining this end.

16. The adoption of preventive measures against the invasion of new pests.

17. The organization of a service of information which will assist in preventing the introduction of new diseases by means of isolating infected and suspected areas.

18. The measures of assuring, to the persons charged with the export service, the efficiency necessary for exporting goods in a satisfactory condition.

d) Protocol of the Convention.

19. The advisibility of leaving the protocol of the convention open, in order that other South American countries may join.

20. The manner and date at which the approved measures will come into force, their duration and the method of proroguing them.

The delegates of each country can lay other schemes before the Congress.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

184 - The Effects of Road-Tarring on Trees at Leghorn [1].

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

BARSALI, E.: Sull'effetto dell'incatramatura delle vie a Livorno. — *Rivista di Patologia Vegetale*, Year 5, Nos. 21.-22, pp. 321-323. Pavia, 1912.

When the new railway-station was built at Leghorn a central road was made leading to the town, parallel with which were side roads shaded by old elms, holm-oaks and planes.

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[1] See No. 967, *B.* June 1912. (*Ed.*).

A portion of the lateral roads was tarred, as was also a part of the main road, where the traffic was continuous. At first, nothing abnormal was noticed, but at the beginning of 1912, the old elms did not bud as usual and the leaves of the holm-oaks and other trees were partially withered. As the season advanced, the withering increased, till in July and August the elms had turned quite brown, and the holm-oaks were so in part, their leaves looking as though they had been burnt, while the planes, which were already injured by *Lithocolletis*, showed also signs of being attacked by this new disease.

The macroscopic and microscopic observations made by the writer on material sent to him, or later collected by himself, agreed with the preceding investigations.

BACTERIAL AND FUNGOID DISEASES.

BACTERIA

185 - The Structure and Development of " Crown Gall ": A Plant Cancer (1).

SMITH, ERWIN, F.; BROWN, NELLIE, A., and MCCULLOCH, LUCIA: *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 255, 60 pp., 2 figs., CIX plates. Washington, 1912.

The parasite of crown gall (*Bacterium tumefaciens*) has been isolated by the writers from 24 species belonging to 14 families of phanerogams. Some species have resisted infection. The parasite has been grown in pure culture on a variety of media and its morphology and cultural peculiarities determined. It has also been stained within the tissues of the tumor and its form and locus therein determined. The morphology and biological peculiarities of the tumor growth have been studied. The tissues of the gall multiply excessively and in opposition to the best interests of the plant. The galled tissue, which is often of a soft, fleshy nature, is much subject to decay. It is not usually corked over, and this absence of a protective surface allows the ready etrance of water and of other parasites. The tumor originates in meristem, usually in the cambium region. It may perish within a few months or continue to grow (parts of it) for years. The tumor consists, or may consist, not only of parenchyma but also of vessels and fibers, *i. e.* ,it is provided with a stroma which develops gradually as the tumor grows. A proliferating tumor usually contains not only meristem but pitted vessels and sieve tubes; it may also contain wood fibers, but does not always. The tumor sends out roots (tumor strands) into the normal tissues. These may extend for some distance from the tumor — how far is not known. These strands consist of meristem capable of originating medullary rays, tracheids, and sieve tubes. In the daisy the strand passes through the protoxylem region of the stem.

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(1) See No. 2967, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*).

It is rich in chloroplasts. It usually takes a deeper stain than the surrounding tissues, from which it is sharply delimited. A considerable part of it consists of unripe, actively vegetating cells. In the substance of these deep-lying strands secondary tumors develop. These gradually rupture their way to the surface.

The secondary tumors tend to take on the structure of the primary tumor, *e. g.*, if the latter is in the stem and the former in a leaf, the secondary tumor shows a stem structure.

The stimulus to tumor development comes from the presence of the parasite within certain of the cells. Apparently it is not in all. The organism has not been observed with certainty outside of the cells, either in the vessels or the intercellular spaces, nor is it abundant in the cells. Usually copious inoculations have to be made to ensure cultures.

Under the microscope it can not be made out in unstained sections with any certainty, and most bacterial stains also fail to differentiate it in the tissues. It is best observed in tissues impregnated with chloride of gold.

By repeated inoculations through a series of years plants were obtained which appeared to be more resistant to the disease than check plants, but after subsequent inoculations on descendants of these plants numerous well-developed primary and secondary tumors appeared, so that the resistance must be regarded either (a) as of a fugitive nature, or (b) as of a low grade easily overcome by a more virulent strain of the parasite. That the cultures used for these subsequent inoculations came from a more virulent strain may be assumed both because they were plated from a tumor which appeared on one of the most resistant plants and because the cultures tried on a great number of plants produced primary tumors very quickly and showed an unusually strong tendency to develop secondary tumors.

The relation between the host and the parasite may be regarded as a symbiosis in which the parasite has the advantage.

The bacterium is a soil organism and planters should aim to keep their lands free from it by refusing to plant infected stock.

Nurserymen should plant on uninfected land and carefully avoid heeling good stock into soil which has previously received infected plants. Nurserymen have been largely responsible for the dissemination of this disease.

The organism is a wound parasite. Its entrance is favored by careless grafting (Hedgcock) and by the presence of borers, nematodes, etc.

These galls occur on the roots of Legumes and have been mistaken for the nitrogen root nodules.

The development of this disease is regarded as closely paralleling what takes place in cancer of men and animals.

There are no true metastases in crown gall, but this does not militate against the comparison, for whether a cancer shall be propagated by floating islands of tissue, or only by tumor-strands, appears to be a secondary matter depending on the character of the host tissues rather than on the nature of the disease. The essential element is the internal stimulus to cell division.

MEANS OF PREVENTION AND CONTROL

186 - The Effect of Bordeaux Mixture on the Spores of *Spicaria farinosa* var. *verticilloides*, a Parasite of the Larvae of Vine Tineids.

FRON. Note sur l'influence des bouillies cupriques sur les spores des champignons du groupe des Isariées. — *Bulletin des Séances de la Société nationale d'Agriculture de France*, Vol. LXXII, No. 8, pp. 742-746. Paris, 1912.

It has been suggested that cupric mixtures, used as a remedy for the different diseases of the vine, hinder the propagation of the spores of the fungi parasitical on the insects which attack this plant.

The writer therefore undertook investigations as to whether the spores of *Spicaria farinosa* var. *verticilloides*, which seems to attack the larvæ of the Tineids *Conchylis ambiguella* ad *Polychrosis botrana* very virulently, are able to develop in contact with Bordeaux mixture, or after a longer or shorter immersion in it.

The results of numerous experiments showed that the fungus spores resisted the prolonged action of Bordeaux mixture; they were not killed by a fifteen hours' immersion in a "5 per cent." mixture, and they germinated normally on the substratum in spite of the mixture being sprayed on the surface of the nutritive medium. These facts correspond to those already observed in the case of other fungi.

It yet remains to be seen whether the infective power of the fungus grown under these conditions is modified as regards its host.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

187 - "Iliau": a Disease of Sugar Cane in Hawaii.

LYON, H. L. Iliau, an Endemic Cane Disease. — *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Pathological and Physiological Series, Bulletin* No. 11, 32 pp., 10 figs, 1 plate. Honolulu, Hawaii, 1912.

The name "iliau" is a native term for a cane disease peculiar to Hawaii. The most conspicuous symptom is a binding of the leaf bases into a tight unyielding jacket about the stem, which prevents the latter making any further growth.

The disease is produced by a fungus whose perfect form is called by the writer *Gnomonia iliau* n. sp.; the imperfect form, previously discovered, being known as *Melanconium iliau*. The *Gnomonia* type of fruiting body is of infrequent occurrence. The ascus spores are discharged into the air and disseminated by the wind, while the *Melanconium* spores are formed in the interior of the diseased shoots and are largely responsible for the local spread of the infection; they are released, however, with the disintegration of the shoot. This takes place in a comparatively short time, if the affected shoot becomes soaked with water. The *Melanconium* spores do not germinate readily in water, and consequently are well adapted to water dissemination. They retain their vitality for long periods if protected from the sun, but are effectually destroyed if exposed for a short time to its direct rays.

Iliau is a disease of young canes. The fungus gains entrance to a shoot by entering the leaf bases, which join the stem below the surface of the soil; once inside the tissues, it causes the above-mentioned change in the latter. Other things being equal, iliau causes a greater mortality among plant canes than it does among rattoons. Cane stools or shoots which have been weakened by any cause are rendered more susceptible to the disease, which flourishes only during cool, damp weather. Demerara seedlings are the most resistant canes now being grown on a large scale, and consequently are good varieties to plant in fields where the disease is apt to flourish.

The most effective precautions that can be taken to minimize the danger of an iliau epidemic are thorough working of the soil and early plantings; these measures should be practised in addition to the ordinary means usually taken to ensure a good stand of healthy cane.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

188 - Fourth International Congress of Rice Growers at Vercelli, Italy (1912): the Control of Weeds in the Rice-Field.

NOVELLI, N. Il IV° Congresso risicolo internazionale. — *Il Giornale di Risicoltura*, Year III, No. 23, pp. 364-365. Vercelli, December 15, 1912.

Amongst the orders of the day passed at the Fourth International Congress of Rice Growers at Vercelli in 1912, were the following:

Subject III. — *The Control of Weeds in Rice-fields*, Part I. — *The Weeds which infest the Italian Rice-fields.* Report by Prof. G. Jacometti.

"The Congress considers, that it is necessary:

"To continue the researches of Prof. Jacometti relating to breaking the life-cycle of the weeds which infest rice-fields, and that such researches should be carried on in all the rice-growing districts of Italy.

"To continue to weed carefully and regularly, not only at the usual season, but during the whole vegetative period of the rice.

"To clean carefully all imported seed, both of rice and of other crops, in the rice-growing districts.

"To invite the Government and the Agricultural Institutions to encourage rice-fields being kept clear by means of propaganda, competitions, prizes, etc.".

Part 2. — *The Best Systems for the Control of Weeds in Rice-Fields.* Report by Profs. V. Alpe and E. Ferrari. "The control of the weeds which invade rice-fields should be practised:

"1) *Outside the rice-field*: by preventing the seeding of weeds growing in the meadows, among maize, or on the banks dividing the fields, and which have escaped the scythe and the weeder, — not using the hulls as litter for animals, — using only such stable manure for rice-fields, as has undergone prolonged fermentation.

"2) *In the rice-field* : by only sowing seed which has been freed from weed seeds ; by sowing and growing the rice for a short time, where possible, in dry soil ; by regulating the water supply in such a manner as to hinder the development of the weeds without harming the cereal ; and by turning the heaps of weeds, which have been collected during the cleaning, at the right time to prevent their sprouting again."

"The Congress passed a vote that the above-mentioned practices should be made the subject of wide-spread propaganda on the part of the Agricultural Institutions of the rice-growing zones."

189 – The Blackberry-Bud Moth : a Promising Agent for Control.

COCKAYNE, A. H. in *The Journal of the New Zealand Department of Agriculture*, Vol. V, No. 4, pp. 372-374. Wellington, October 15, 1912.

The Blackberry (*Rubus fruticosus* L.) was introduced into New Zealand as a cultivated plant ; it then spread from place to place to such an extent that it has now become a very serious weed. Where cropping and temporary pastures form the basis of all farming operations the blackberry is not a dangerous problem. But where the bush has been converted into permanent pastures the blackberry is decidedly pernicious, and from the cleared country it has extended to the areas of standing timber, but here it is in general restricted to the outskirts.

The blackberry is spread by seed which is conveyed by animals, chiefly birds. The individual plants by means of their arching branches which bend down to the ground and then root, soon form extensive impenetrable thickets.

The main methods of control that have hitherto been employed have been cutting and burning, followed, in the case of pastures, by keeping the young fresh growth mowed down. In country which is very rough and where stumps and logs are numerous, the use of goats has been followed by excellent results. But these methods are necessarily expensive for large areas.

Up till quite recently the blackberry was singularly free from the attacks of any natural enemy that might be of value in its control. For a number of years past several parasitic fungi, notably orange-rust (*Caeoma nitens*), have been noted as occurring sporadically, but in no cases have their effects justified the opinion that any of them would prove efficacious. During the past two years, however, a hitherto rare native moth, *Carposina adreptella*, belonging to the Tortrix group, has suddenly multiplied enormously, attacking the young shoots of the blackberry, and destroying them to such an extent that hopes are entertained that it may prove an exceedingly valuable agent in controlling the spread of blackberry.

The eggs of the moth are laid in the leaf bases of the young shoots or in the bud itself. The larvæ hatch very soon, penetrate the soft tissue and bore through the pith for a distance of perhaps 2 inches. This is followed by the complete death of the terminal shoot and consequently the spreading by means of pendent branches is eliminated. The plants attacked remain small in size and isolated, besides which they appear to lose their power of producing flowers and fruit to the same extent as the unaffected ones. Perhaps the insect attacks the flower buds also, but this is a point that has not yet been investigated.

INSECT PESTS.

GENERALITIES

190 - Papers on Coccidae, or Scale Insects. The Genus *Fiorinia* in the United States.

SASSCER, E. R. in *U. S. Department of Agriculture, Bureau of Entomology, Technical Series*, No. 16, Part V, pp. 75-82, plates X-XIII. Washington, December 6, 1912.

The genus *Fiorinia* Targioni, at the present time consists of some 30 described species and 4 varieties, and of this number there are only two species (*F. theae* Green and *F. fioriniae* Targioni) and one variety (*F. fioriniae* var. *japonica* Kuwana), at present known in the United States.

The writer first gives a description of the genus and then describes the three species of *Fiorinia* mentioned above, discussing their synonymy; geographical distribution, food plants and natural enemies.

The tea scale (*F. theae*) is recorded on camellias in Alabama, in the District of Columbia, Florida, Georgia, Louisiana, North Carolina and South Carolina. It has been collected also in Ceylon, the Philippine Islands and in various localities in India.

In the United States, this scale has only been found on camellias and tea, but in India it has been recorded also on olive (*Olea glandulifera*) and citrus; in the Philippines it occurs on a species of *Caryola*, and in the Royal Botanic Gardens at Peradeniya, Ceylon, on *Ostodes*.

Although *F. theae* seems to show a preference for tea at Summerville, South Carolina, it appears to be quite a serious pest on the camellias in several of the more Southern States, and is not infrequently found associated with *Lepidosaphes lasianthi* Green.

This scale is controlled by *Chilocorus bivulnerus* Muls., *Microweisea misella* Lec. and *Cybocephalus nigritulus* Lec. On the tea at Darjeeling these coccids are frequently covered by a parasitic fungus, which is doubtless in a measure effective in holding this pest in check.

Fiorinia fioriniae has a wide range of distribution and is known to occur in the following countries: Algeria, Australia, Barbados, Brazil, Ceylon, China, Egypt, Europe (Belgium and Spain), Jamaica, Japan, Madeira (?), Mauritius, Mexico, New South Wales, Peru, United States (Alabama, California, Colorado, District of Columbia, Louisiana, Maryland and Massachusetts), Hawaiian Islands, West Africa and Zanzibar.

The most important food plants of this scale are: *Anthurium acaule*, *Apollonias canariensis*, *Aralia*, *Areca aurea*, bamboo, bay, *Camellia*, *Celtis mauritiana*, *Chamaerops humilis*, coconut palm, *Cupressus*, *Cycas circinnalis*, *C. revoluta*, *Dracaena indivisa*, ferns, *Ficus elastica*, *Ficus* sp., *Garcinia* sp., *Hedera Helix*, Japanese Quince, *Kentia Belmoreana*, *K. Forsteriana*, *Larix* sp., *Leptospermum*, *Licuala*, *Livistona*, *Persea gratissima*, *Phoenix canariensis*, *Phoenix* sp., *Phormium tenax*, *Phytelephas macrocarpa*, *Podocarpus*, *Strelitzia Reginiae*, tea (*Thea japonica*).

Amongst the natural enemies of *F. fiorinae* are recorded : *a*) *Aspidiotiphagus citrinus* Craw., found enclosed in the body of an adult specimen of this scale in Washington, D. C., and on *Chamaerops humilis*; the same chalcid has also been reared from material on *Persea gratissima*, from Honolulu, Hawaii; *b*) another species of *Aspidiotiphagus* was reared from this scale on an undetermined plant collected at Hongkong ; *c*) *Prospaltella aurantii* How., collected from this coccid on *Ficus* sp., at Swatow, Canton, China ; *d*) *Sphaerostilbe coccophila*, the "red-headed fungus," observed in Mauritius on infested Camellias.

F. fioriniae var. *japonica*, although a native of Japan, has been introduced into the United States on numerous occasions on infested evergreens. In September of 1908 it was collected on *Tsuga* sp. at Queens, Long Island, and subsequently on Japanese hemlock at New York. In June 1909, it was observed on the fruit and leaves of *Podocarpus elata* received by the Bureau of Plant Industry from the Botanical Gardens of New South Wales. It has also occurred on *Podocarpus chinensis* and *Pinus* sp. in California ; on *Podocarpus Nageia* and *Abies Veitchii* in the Philippines ; and on *Pinus pentaphylla*, *P. Thunbergii* and *Tsuga Sieboldii* in Japan.

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191 - Parasites of Apple Weevil observed in the Valle-di-Non (Trent, Austria).

CATONI, GIULIO. : Parassiti dell'*Anthonomus pomorum* (L.) osservati in Valle di Non (Trentino). — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol. VI, pp. 148-150, figs. I-II. Portici, 1912.

Of 3000 apple blooms gathered in April 1911 in the Valle di Non (Trent, Austria), and each containing a larva of the weevil (*Anthonomus pomorum*), in 846 or 28.2 per cent. the weevil larva was attacked by a parasite. Each of the diseased larvæ was placed in a glass tube, or in a little bag of very fine gauze. The flowers containing healthy larvæ were covered with a bell-jar. At the time that the adult weevils appeared beneath the bell-jar, it was observed that from the 846 parasitized larvæ four Hymenoptera emerged, in the following numbers : 647 *Pimpla pomorum* Ratzb., 63 *Meteorus ictericus* (Nees), 29 *Habrocytus fasciatus* Thoms and 6 *Apanteles impurus*, with a noticeable preponderance of females ; 63 larvæ shrivelled up, and the remaining 38 were destroyed by a fungus determined as *Verticillium puparum*.

192 – Experiments in France in Acclimatizing some Species of *Glandina* which destroy other Gasteropods (1).

1. VILMORIN (de) PHILIPPE. Observations sur les Glandines à Verrières-le-Buisson. — *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 155, No. 23, pp. 1289-1294 + 1 fig. Paris, December 2, 1912.

2. BOYER, JACQUES. Les Glandines, Mollusques carnassiers du Mexique. — *La Nature*, Year 41, No. 2061, pp. 20-21 + 3 figs. Paris, December 14, 1912.

3. LAVERGNE, GASTON. Les Glandines ennemies des Limaces et des Escargots. — *Revue de Viticulture*, Year 19, Vol. XXXVIII, No. 993, pp. 754-758 3 figs. Paris, December 26, 1912.

Prof. Bouvier has received from Mexico, and has distributed to several members of the Société Nationale d'Agriculture de France, specimens of carnivorous snails of the genus *Glandina*, which he proposes to acclimatize in France for the purpose of controlling the other gasteropods which infest garden plants.

Of the 134 species of *Glandina* so far described, 53 are natives of the Antilles, and principally of Cuba, Jamaica, Haiti and Porto Rico; 48 of Mexico; and 8 of Guatemela; most of the rest come from other countries of South America, though a few species are indigenous to the countries bordering the Mediterranean. The European species do not possess, like their Americam relatives, powerful labial palps, enabling them to adopt a carnivorous diet.

The observations of M. Philippe de Vilmorin were made on 25 specimens of *Glandina olivacea* Schum. (*G. guttata* Crosse and Fischer) which were kept in the open at Verrières-le-Buisson, near Paris, from June to November 1912. It appears that *G. olivacea* devours snails with avidity, but does not seem to eat slugs, at any rate those of the genus *Arion*; it does not touch plants. It pairs and lays eggs in the Paris zone. It remains to be seen whether these eggs hatch out and whether the adults are able to stand the winter temperature. At —4°C. some died, while others went into a torpid condition.

M. Lavergne gives a description of the species of *Glandina*, with their geographical distribution and a list of 51 Mexican species; he mentions the previous acclimatization experiments in France and the recent experiments of Prof. Bouvier and Prof. Berthier, and refers to various observations made in France and Mexico on the habits of *Glandina*.

193 – The Caterpillar Pest of the Mokameh "Tal" Lands (2).

WOODHOUSE, E. J. and FLETCHER, T. BAINBRIGGE in *The Agricultural Journal of India*, Vol. VII, Part IV, pp. 343-354 + 2 maps and 1 fig. Calcutta-London, 1912.

For the last fifteen years or so the winter crops on about ten thousand acres of «Tal» land near Mokameh, on the southern bank of the Ganges near Patna, have been destroyed annually by *Agrotis ypsilon* caterpillars. These lands are flooded during the rains (June to September) to a depth of 5 to 15 ft., and are ploughed and sown as soon as the water recedes. The moths are apparently attracted to the wet mud, and lay their eggs there; the larvae attack the crops as soon as these spring up, rapidly increasing in numbers until the whole crop is totally destroyed. The crops chiefly sown are «masur» (lentil) and «khesari» (*Lathyrus sativus*), with some peas on the higher lands. This damage was reported in 1909, but the caterpillars had then already increased to such an extent that no remedial measures were of avail. In 1910 trials were made of handpicking, which was considered efficient if properly organised. In this year practically a normal amount of damage was done. In 1911 systematic handpicking of the caterpillars was adopted as soon as they appeared, and over sixty thousand early broods were thus destroyed before the middle of November. Trial was also made of the moth-traps produced by Messrs. Andres Maire et Cie., Alexandria, and containing «Prodenine», an attractive liquid specially produced to destroy the moths of *Prodenia litura* (*littoralis*), whose caterpillars attack cotton in Egypt. Over two thousand female *Agrotis* moths were caught in one trap during November. As a result of these measures it is claimed that over six thousand acres of crops were saved. Further and extended trials ot these traps and of hand picking will be made,

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(1) See also No. 1369, *B*. Sept. 1912. (*Ed.*).

(2) See No. 83, *B*. Jan. 1913. (*Ed.*).

INSECTS
JURIOUS
VARIOUS
CROPS

194 - Notes on Insects injurious to Cotton in South Africa.

MOORE, W. in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 5, pp. 714-720, 1 plate. Pretoria, November 1912.

Of late years, the cotton crops of South Africa have been much injured by insects; in some cases the loss has been as high as 75 per cent, or more.

From his recent observations, the writer describes the species harmful to the cotton plant and the methods of control which are at present in use.

The most important pests are *a*) the spiny cotton-boll worm (***Earias insulana***), known in the Sudan as the "Egyptian cotton-boll worm" and in India as the "spotted cotton-boll worm" (1); *b*) the common cotton-boll worm (*Heliothis armiger*), which often attacks peas, when it is known as the "pea worm," but also injures roses, carnations, and the young fruit of peaches, apricots, apples, plums, nectarines, tomatoes (tomato-worm), tobacco (tobacco-worm), maize (mealie-cob borer, not the mealie-stalk borer); *c*) the cotton stainer (*Dysdercus nigrofasciatus*); (2); *d*) the dusky cotton bug (*Oxycarenus lactus*); *e*) the cotton scale (*Pulvinaria jacksoni*); *f*) the cotton aphis (*Aphis gossypii*).

Besides the above-named insects, which are the most serious cotton pests so far noticed in South Africa, the cotton leaf roller (*Sylepta derogata*) (3) should be mentioned, also a species of leaf bug of the family Capsidae, the green stink bug (*Nezara viridula*) and the black-and-red stink bug (*Atelocera stictica*).

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(1) See No. 3048, *B.* Aug.-Sept.-Oct. 1911.

(2) See No. 1975, *B.* June 1911.

(3) See also No. 656, *B.* April 1912. (*Ed.*).

195 – *Conorrhynchus luigionii* and *Lixus junci* destructive of Sugar Beets in Campania, Italy.

Rossi, Romolo. Alcune notizie intorno a due Cleonini, *Conorrhynchus Luigionii* Solari e *Lixus junci* Boh. (*Coleoptera-Curculionidae*), dannosi alla barbabietola da zucchero nella Campania. — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol. VI, pp. 26-42, plate I. Portici, 1912.

The damage done to sugar beets in Italy by *Conorrhynchus luigionii* Solari was observed for the first time during the spring of 1906 in some fields in Campania, whence in the space of a year this beetle spread throughout the neighbourhood. *Conorrhynchus luigionii*, in the adult state, devours with surprising voracity the leaves even of the youngest plants and in the larval form it destroys the pulp of the root.

Lixus junci Boh. appeared contemporaneously with the above mentioned pest in the sugar beet fields of the same district, and spread there more rapidly. This is due partly to the fact that it is able to fly and partly to its practice of attacking garden plants besides sugar beets. The chief injury is caused by this beetle when the beets begin to germinate, since the females deposit their eggs at this time in holes, which they excavate with their rostra in the stalks of the plants. Nearly all the beets thus attacked die, being actually cut in two. Other eggs are laid along the veins of the leaves when the plants have developed well. The larvæ, as soon as they hatch out, excavate long galleries in the roots, gnawing away a good deal of the pulp.

As a means of controlling both these beetles, the writer especially recommends seeking out the adults in their hiding-places: under stones or clods, in crevices of the soil and under leaves, thus entirely freeing the fields from these pests. As a supplementary measure only, the leaves of the beets may be treated with insecticides (different solutions of arsenic salts; with a 4 or 5 % barium chloride solution; arsenite of sodium at 1.5 % with the addition of 10 lbs. of flour to every 100 gallons of solution to make it stick; carbon disulphide; arsenate of lead from 1 to 1.5 %; copper arseno-acetate at 0.15 %).

196 – Insect Parasites of *Atriplex hortensis*.

Noel, Paul.: Les ennemis de l'Arroche. — *Bulletin du Laboratoire régional d'Entomologie Agricole*, First Quarter 1913 (Jan.-March), pp. 6-8. Rouen, 1913.

The writer enumerates the numerous insect parasites of this kitchen-garden plant.

Coleoptera: *Mecaspis fasciatus* Müller, *Cassida margaritacea* Fb., *C. nebulosa* L.

Hemiptera: *Aphis papaveris* Fb., *A. atriplicis* Fb., another undetermined species of Aphis, two undetermined Psyllids, *Trioza atriplicis* Licht.

Lepidoptera: *Arctia caja* L., *Hadena aleracea* L., *Agrotis ianthina* Hb., *A. fimbria* Hb., *A. sigma* Hb., *A. plecta* Hb., *A. putris* L., *A. ripae* Hb., *Caradrina superstes* Tr., *Mycterophus punicea* God., *Mamestra peregrina* Hb., *M. chenopodii* Hb., *M. suasa* Hb., *Hadena atriplicis* Hb., *Hydroecia micacea* Esp., *Calocampa exoleta* L., *Brotolomia meticulosa* Hb., *Eupithecia subnotata* Hb., *Cidaria chenopodiata* S. V., *Gelechia naeviferella* Dup., *G. atriplicella* F. R., *G. obsoletella* F. R., *G. hermannella* Fb., *Heliodines roesella*, *Coleophora unipunctella* Zell., *C. binotatella* Zell., *C. flavaginella* Ill., *C. annulatella* Tenst., *Butalis chenopodiella* Hb., *Spermatophthora hornigii* Led., *Goniodoma auroguttella* F. R., *Pterophorus pterodactylus* L., *Coleophorus stephanii* Joannis and one undetermined moth.

Diptera: *Pegomyia hyosciami* Macq., *Asphondilia conglomerata* Stefani, *A. punica* Marchal, five undetermined Cecidomyids, *Stefaniella trinacriae* Stefani, *S. atriplicis* Kieff., *S. brevipalpis* Kieff.

Acari: *Eriophyies heinii* Nal., *E. brevipes* Nal., and one undetermined species of *Eriophyies*.

197 – Enemies of the Spinach.

NOEL, PAUL.: Les ennemis des Epinards. — *Bulletin du Laboratoire régional d'Entomologie agricole*, First Quarter 1913 (Jan.-March), pp. 13-14. Rouen, 1913.

A list of the parasites of this kitchen-garden plant:

Lepidoptera: *Arctia villica* Hb., *Amphipyra tragopogonis* L., *Heliodines roesella* L.

Nematoda: *Heterodera schachtii* Schmidt, *H. radicicola* Greeff.

Fungi: *Peronospora effusa* Grev. (1).

198 – The Elegant Grasshopper.

The Agricultural Journal of the Union of South Africa, Vol. IV, No. 5. pp. 753-755. Pretoria, November 1912.

Zonocerus elegans, the Elegant Grasshopper, known to many farmers as the "stinksprinkhaan," causes much damage every year in many parts of South Africa. In 1911, it was unusually abundant in parts of the Cape Province and of the Transvaal.

The insect is especially troublesome in gardens and orchards; it is particularly fond of fruit and will attack almost any kind of vegetable, even including onions.

As the elegant grasshopper does not move in swarms, nor migrate far, its control is a local matter and its presence is little regarded by the Central Government.

Many insecticides have been used for its destruction, but the results have not always been satisfactory, owing to the dangers to plants and cattle which are incurred by their employment.

The most practicable way so far known of dealing with the pest in gardens, appears to be the collection of the young grasshoppers in nets (similar to butterfly-nets but of stouter material), or in an improvised bag. The insects should then be turned into a vessel containing a small quantity of paraffin floating on water. Thousands may be caught and killed in a few minutes in this manner.

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(1) See No. 579, *B.* March 1912 and No. 70, *B.* Jan. 1913. *(Ed.)*.

199 – The Green Oak Tortrix in Italy.

CECCONI, GIACOMO. La Tortrice delle querce in Italia (*Tortrix viridana* L.) *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici*, Vol. VI, pp. 308-319. figs. 1-6. Portici, 1912.

In 1911 for the first time a slow and continually increasing destruction of the oak leaves due to the attacks of the larvae of the Green Oak Tortrix (*Tortrix viridana* L.) was observed in the oak woods of some districts of Venetia, Romagna, Tuscany and the Marches. In 1912, the attack was repeated and with still more serious results.

This insect, which is widely spread in Central and South Europe, Finland, South Sweden and Norway and in Asia Minor, had hitherto only been observed in North and Central Italy; but according to the data collected by the writer, it is equally common in the South.

Sig. Cecconi gives a systematic description of the species, followed by some biological notes. The moth appears in Italy from the 20th of May to the 20th of June. The female lays its eggs around the buds, or in their vicinity; the eggs survive the winter and only hatch out in the spring, when the larvæ begin to devour the leaf and floral buds, and then attack the young foliage, of which they only leave the veins, fastening them together with silky threads. When the larvæ are full-grown, they devour the other leaves, only sparing a fragment here and there attached to the principal nerves. The leaves, or rather leaf-fragments, are fastened together and rolled, thus forming a shelter for the caterpiller during its moult. When about a month old, the caterpillar pupates within this envelope.

The trees of an entire forest may be completely defoliated by these caterpillars, which sometimes devour even the axes of the catkins, which fall, and also the peduncle and base of the young acorns. This causes, if not the death of the tree, at least a hindrance in its development and hence in that of the wood, and brings about the loss of the fruit.

The measures of natural control which are most recommended are the protection of the insectivorous birds found in oak-woods (tits, warblers, finches, etc.) together with the protection and diffusion of the natural parasites of the pest. In 1911, the writer succeeded in breeding various Hymenoptera (seven Ichneumonids, one Braconid, two Chalcids), and three Diptera. The writer comes to the conclusion, from his examination of the material received in 1912, and from comparing the results of this year's breeding with those of 1911, that at present the Ichneumonids (and especially *Pimpla maculator* F.), which are the commonest parasites, are only found in Venetia. In Tuscany, on the other hand, there are Braconids and Chalcids, as well as some Diptera. No parasites were obtained from the material from the Marches, which however does not prove their absence in this district. If the Ichneumonids were numerous in the forests of Venetia, they, as well as the Braconids, Chalcids and Diptera, might with advantage be transported to other districts.

Artificial remedies have so far proved practically useless.

200 – *Rabdophaga saliciperda* damaging Willows in Italy.

Cecconi, Giacomo. La Rabdofaga distruttrice dei salici in Italia (*Rhabdophaga saliciperda* Duf.). — *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore in Portici*, Vol. VI, pp. 320-330, figs. 1-3, plate II. Portici, 1912.

The Willow-wood Midge (*Rhabdophaga salicıperda*) was discovered in 1841 in France, Austria and Germany. The writer was the first to record its occurrence in Italy — in the Province of Florence, in 1910, on *Salix alba* L. Outside Italy, this midge attacks other species of willows and also *Populus alba* L.. It is injurious only in its larval condition, when it tunnels into the wood of young trunks and branches. At first the cortex of these portions remains intact and of the same colour as unaffected parts, while the exterior has an irregularly undulating, mammilated appearance. Gradually the colour of the cortex changes, becoming a reddish-brown, and slight longitudinal cracks appear. The cortex continues splitting longitudinally, and when the time for swarming comes, it appears completely perforated, becoming continually darker; then it dries up and gradually becomes detached, and the fragments fall to the ground. Thus the cavities made by the larvæ are exposed to view, and the wood assumes a blackish colour.

In the meantime, the tree has begun to react, forming a cicatrice all round the zone occupied by the cavities of the larvæ. As, however, the females prefer laying their eggs around the injured zone, the destruction continues in the second, the third, and even the fourth year, provided the trunk and branches are of a sufficient size. In this case, the affected zone extends in length and width, so as to almost completely encircle the trunk, or branch, which then breaks off at this point. The upper portion of the larva-infested zone withers very soon, so that the thin stems and the branches break off directly after the first or second year's attack.

So far, no parasites of *Rhabdophaga saliciperda* had been mentioned, but the writer, in three years' consecutive breeding, obtained five belonging to the Hymenoptera (*Platygaster* sp., *Eutelus* sp., *Tridyminarum* sp., *Torymus tipulariarum* Zett. and *Eurytoma* sp.), which will be described in another work.

As a remedy against the midge, it has been recommended to cover the infected parts of the tree with a viscous substance, so as to prevent the exit of the pupæ and the adult insects. The infected parts may also be cut off and burnt.

According to the writer, use can be made of the five above-mentioned parasites and especially of *Torymus tipulariarum*, which increased so much from 1910 to 1912, that it alone destroyed 60 per cent. of the larvæ of the midge in some trunks and branches.

201 - An Insect Pest of the "Currajong" *(Brachychiton)*.

FRENCH, C. Junr. in *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. X, Part 11, p. 662, 1 plate. Melbourne, November 1912.

The "Currajong" (*Brachychiton populneum* R. Brown = *Sterculia diversifolia* G. Don), is much cultivated in Victoria (Australia) as an ornamental tree in large private gardens, public parks and avenues, etc. In times of drought, in some parts of the interior of Australia starving stock have been saved by eating the leaves of these trees and also the roots, if they happened to be exposed.

A Psyllid, *Tyora sterculiae* Froggatt, attacks the leaves of the "Currajong," which causes them to become discoloured and spoils the appearance of the trees themselves. The parasite was first discovered at Forbes, New South Wales.

The most effective means of dealing with this pest is to spray the trees with kerosene, or benzol emulsion, pine oil spray, or any other mixture which kills insects by contact.

RUGGERI ALFREDO — *Gerente responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of January and February 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

Agricultural Economy of Japan: Principal Features; Present Conditions of Production.

by

Dr. YOKOI (TOKIYOSHI)

Professor of Agricultural Science at the Imperial University of Tokyo.

In giving the following description, the author takes as geographical limits the so-called "Old Japan," that is, the Main Island, Shikoku, Kyushu, and the small islands, but not Hokkaido, the Loochoos, the newly acquired domain in Formosa, nor the continental colonies.

Since the Country is so greatly extended from south to north, the agricultural products obtainable within the limits of "Old Japan" are quite numerous, including many of a sub-tropical nature side by side with the staples of the temperate zone

Moreover, varied formations of underlying rocks give rise to so many kinds of soils, that the full study of the agronomy of the Country is, as may be readily supposed, by no means an easy task.

In one point, however, every part of the "Old Japan" is alike, and that is in the great number of small farmers on holdings that are perhaps too small. It is a striking fact and one strange for so old a country, that, excluding Hokkaido, only 17.5 % of the total area is under cultivation. Putting the population at 50 000 000 of which 60 % belongs to rural population, it is no wonder that the average size of a farm on which a family with 4 to 7 members must subsist, is only 1 *cho* (2 ½ acres). This gives rise to an intensive system of farming, or rather of cultivation, for little is done in the way of raising livestock except in hilly districts or on waste lands that cannot easily be tilled.

The so-called "Areas under Cultivation," which are by far the most important from an economic point of view, are mostly devoted to the cultivation of cereals and other important staples, and not to forage crops. Evidently, much labour is needed and fertilisers must be abundantly used for this purpose. The system of land tilling remains primitive and the work is done mostly by hand, although the use of domestic animals for agricultural operations is so needed. Farmers do not venture to purchase effcient farm implements of modern type, as they are too expensive and they might not pay. In one word, the hand is the principal factor in cultivation, and "Spade Farming" is an apt designation of the system of farming throughout the Country.

Cultivation of grain crops. — Rice is the most important and the most extensively cultivated crop, the acreage of "ta" or paddy fields, the land specially devoted to it, being 2 880 000 cho, that is more than half of the total area under cultivation, estimated at 5 660 000 cho including Hokkaido and the Loochoos. Moreover it is cultivated in ordinary or upland fields where upland rice is grown. Indeed in paddy fields a few other crops such as rushes for matting are cultivated to some extent instead of rice, but in warmer parts rice is often grown as their after crop too.

The greatly increased price of rice may make it feasible to bring under cultivation waste areas which have remained so owing to lack of water for irrigating purposes. An outlay of capital for irrigating ditches would bring a large area into use for the production of rice. Even now, the slopes terraced high up for the cultivation are one of the striking features in the landscape of the Country. Where water is available, the rice field is never absent, although in the northern sections of the Empire the industry is risky as the summer is not sufficiently long, the middle of Hokkaido, or more exactly 44° N. being the limit of this crop.

The labour necessary for laying out of rice field, sowing, transplanting, weeding, and harvesting is that of 20 to 40 hands for an area of 1 *tan* (1/4 acre); a good yield for one *tan* is 3 *koku* (1 *koku* = almost 5 bushels) or even to 4 *koku* on the best fields.

The average annual crop of rice in Japan is considered to be 50 000 000 *koku*; the actual production is, however, somewhat larger than the above figure, as farmers generally hesitate to give the exact yield.

Out of the total area of "ta", nearly 39 % can be dried up in the winter months and planted with other crops, such as barley, rape-seed, green manure, etc., thus securing two crops a year from the same ground. The remaining larger portion, 61 % of "ta" may be reckoned as wet all the year round, and this might be turned with advantage into "Dry Paddy Fields" by introducing a suitable system of drainage.

Next to rice in importance comes barley. This cereal is cultivated almost throughout Japan and is of two kinds, — the naked and the ordinary varieties. The former has for its zone the whole of the southern part of Japan, while the latter is extensively cultivated in the rest of the Empire. Unlike in Europe, this cereal forms here a staple food-stuff of the people, especially among the agricultural portion; it is likewise used to feed horses and is made into malt, since beer brewing has come into considerable importance

Other cereals such as wheat, millet, foxtail, Italian millet, barnyard millet, and buckwheat are also raised. Maize is cultivated almost alone in mountainous districts and there it is a staple article of food.

Leguminous products such as peas, soy-beans, kidney-beans, and red-beans (*Phaseolus radiatus*) are among the important crops. Among root-crops, sweet potatoes, *daikon* (a sort of radish), the taro root (colocasia) and potatoes are widely raised. Sweet potatoes thrive wonderfully in the southern provinces, while *daikon* is extensively cultivated all over the Country. The former is a regular article of diet in many of the producing provinces, and so is the latter in the cooler parts of the Country.

Cultivation of Industrial Plants. — "Intensive farming" naturally necessitates the cultivation of such industrial plants as assure a higher remuneration than ordinary food crops. The areas so used are quite extensive and come up to 4.82 % of the total area under cultivation, which is greater than that in other countries similarly situated. Tea, which is grown principally on hilly districts as well as in ordinary fields, is an important article of commerce, and is universally used for making the national beverage.

Tobacco culture is not without importance ; since the introduction of the state monopoly, the area devoted to it has decreased although the value has not suffered any reduction.

Sugar cane is still cultivated in many places, but it has lost its former importance. So also has cotton in a greater degree, though efforts are being made to grow it in some parts of the Empire.

Vegetable wax, which is obtained from the berries of the rhus tree, is produced in the warmer parts of the Country on land of little value.

As to indigo, as may be supposed, the substitution of artificial indigo has considerably demoralised the market, and has reduced the area under cultivation.

Among textile plants, hemp retains its importance. Lately, the cultivation of rushes in the manufacture of matting is becoming a paying business, especially in the western part of the Country. The finished product thus made is steadily finding an increasing market both at home and abroad.

Osiers are produced for making into baskets, light portmanteaus, etc. Osiers are grown both on wet and dry land.

Among oleaginous crops, rape comes foremost in the list. The plant was once cultivated in upland fields, but in these days it is grown mostly on rice-fields as a second crop. Owing to the use of petroleum and other methods of lighting, rape-seed oil has lost its old position of importance as an illuminant.

We have elsewhere referred to the fact that no forage crop of importance is produced. In place thereof, however, we have the leaves of the mulberry tree used in feeding silk-worms. Needless to say, there is not a province where the cultivation of this valuable tree is possible in which silk-worms are not raised.

Live Stock. — Among domestic animals, horses and cattle are by far the largest in number. They both do great services as beasts of burden and in agricultural operations. Cattle are, however, far smaller in number than in other countries. Cows are generally put to work in tilling land.

As to the dairy industry, its importance is far behind that in European countries. A limited number of milk-men are found in urban districts only to furnish the city people with fresh milk. Cheese and butter are too little to be of any significance.

Many farmers who have been hitherto exclusively occupied in the cultivation of rice and other field crops are now turning their attention to the more profitable live stock. The fattening of domestic animals, which has been little practised so far in the Country, has been introduced in a few localities and promises a good future.

As referred to in the first part of this treatise, both horses and cattle are raised mostly in mountainous districts, where land is less valuable or where the cultivation of rice is hardly possible. Particular mention of horse raising is unnecessary here. Calves are generally sold before they are a year old ; they are bought and reared for some time by farmers in the plains and they are resold. They often change hands three or four times before attaining their full maturity. Goats and swine are now being raised in many provinces

The Poultry and Other Industries. — The poultry industry is coming into vogue among farmers as a secondary one, although still a large proportion of eggs is imported from neighbouring countries, especially from China.

Fish are raised in many places. Carp, which are highly prized as an article of food, are successfully propagated in rice fields; while these are still covered with water in the early stages of rice cultivation, there is sufficient water for young fish.

Sericulture, or cocoon culture, is carried on all over the Country and is a valuable resource of the people and the country at large. Some of the farmers reel their cocoons themselves, but most of the cocoon raisers sell their products to the middlemen who resell them to the filatures. The industry which is so lucrative from one point of view is not without its evils from another, for the profits are such that nowadays many who were formerly steady thrifty country people have formed luxurious habits which are most injurious to them. The production of bivoltine and trivoltine cocoons is increasing very fast, but the continued taking of leaves is liable to impoverish the soil. In many places the co-operative method of rearing worms has been adopted, the worms being cared for by experts until the third stage is reached when they are divided among the farmers.

Other Secondary Industries and By-Products. — Peasants are generally engaged in different sorts of minor industry, beside their work in the fields ; some earn money by jobbing while others engage in work as mechanics during their leisure time. Rice-straw is much used in all sorts of work and many find occupation in making ropes, sandals, etc., during their leisure hours. The plaiting of barley straw into braid for the manufacture of hats is done by the women and children of the rural population. These products command a good price both in the domestic and the foreign markets. One reason why farmers in this country make an abundant use of fertilisers is the utilisation of straw and the consequent exhaustion of the soil.

Weaving is still done by the women in some places; paper-making, silk-reeling, the weaving of matting, plaiting of chip braids, basket work, and wood working are other minorindustries, in which the agricultural population find occupation for their leisure time. These industries should, of course, be studied and watched by parties interested in rural economy.

Summing up what we have said, we conclude that the area under cultivation in this country, even in the densely populated parts, is comparatively smaller than in any other old country. This is due principally to the mountainous nature of the Country which reduces the arable area. The minute division of the land hinders the use of efficient agricultural implements; and the little attention paid to the raising of domestic animals makes much of the hilly land of no use.

The greater part of the farmers who cultivate paddy fields only are not provided with land enough to occupy their time when two crops are raised on the same rice field, as in the warmer portions of the Country. The busy time is limited to two periods of the year, and the cultivators have the rest of their time at their disposal. In those places where there is no rice-land, or where dry fields predominate, the farmers have their time better occupied in their work than is the case with the cultivators of rice fields only. The holders of dry upland fields must get their living in part by engaging in the cultivation of industrial plants or other special crops; for the cultivation of cereals alone, with the exception of rice, is not sufficient for the support of their families. Thus, we are disposed to believe that the best form of land holding for a farmer is a combination of wet and dry land in such degree, that his labour can be used to the best advantage. Peasants who have not sufficient land to work for themselves must naturally engage in day labour or must get their living by occupying themselves in minor industries. Along the sea coast or in lake districts, they engage in fishing; and in mountainous districts they engage in forest work.

Below we append data on principal crops with the acreage, including Hokkaido and the Loochoo Islands, for the year 1910 (1911*).

Crops	Acreage		Production			
—	cho	acres	—			
Rice	2 949 439	7 226 126	46 633 376	*koku*	231 536 040	bushels
Barley(*)	598 565	1 466 484	9 385 818	,,	46 580 876	,,
Naked barley(*)	667 234	1 634 723	7 505 811	,,	37 250 589	,,
Wheat(*)	499 204	1 223 050	5 009 840	,,	24 863 335	,,
Foxtail millet	189 474	464 211	2 092 699	,,	10 385 856	,,
Barnyard millet	61 231	150 016	775 315	,,	3 847 811	,,
Maize	53 300	130 585	722 429	,,	3 590 306	,,
Buckwheat	156 591	383 648	1 311 575	,,	6 509 216	,,
Soy-bean	478 137	1 171 436	3 396 716	,,	16 857 562	,,
Red-bean	141 074	345 631	965 796	,,	4 793 149	,,
Sweet potatoes	283 207	718 357	832 877 987	*kwan*	6 871 243 393	lbs.
Potatoes	68 384	167 541	179 397 660	,,	1 480 030 695	,,
Radishes	104 681	256 468	657 489 683	,,	5 424 289 885	,,
Rape-seed	138 446	339 193	1 048 051	,,	8 646 421	,,
Tea(*)	50 213	123 022	8 151 413(*)	,,	67 249 157	,,
Tobacco	29 724	72 824	10 996 866	,,	90 724 144	,,
Mulberry	450 550	1 103 847				
Hemp	12 317	30 177	2 430 210	,,	20 049 232	,,
Rush for matting	3 704	9 075	8 839 906	,,	72 929 224	,,
Shititoi (another kind of matting)	2 225	5 451	3 894 848	,,	32 132 496	,,

Live Stock		Number
—		—
Cattle		1 384 183
Horses		1 564 643
Pigs		279 101
Fowls	Mature	12 503 196
	Young	8 145 412

Cocoons (weight). 3 900 962 *kwan*. (45 382 893 lbs.)
Green manure . . 380 537 cho (930 940 acres) 1 056 770 284 *kwan* (8 718 354 843 lbs.

(*) Manufactured.

Recent Investigations at Rothamsted.

by

Dr. E. J. Russell,

Director of the Rothamsted Experiment Station, England.

For many years before their death, Lawes and Gilbert devoted their attention exclusively to crop production, and this policy has been adopted by their successors. Investigations at Rothamsted are now restricted to soil and plant nutrition problems, and no attempt is made to deal with such subjects as plant breeding, animal husbandry, etc., for which provision is made elsewhere. A further feature of Rothamsted is that it has no local duties to perform ; the Staff are not called upon to analyse fertilisers or feeding stuffs, to advise, or to conduct demonstration plots of an educational nature.

The limiting factor in crop production in England is commonly the nitrogen supply; it very generally happens that an increased application of a nitrogenous fertiliser leads to increased crop yields. For this reason fertility problems in this country often resolve themselves into questions of the nitrogen supply, and such questions therefore claim a very large share of attention. Of course the other factors are borne in mind as well, but the keynote to much of the work is the necessity for understanding more fully the nitrogen cycle in the soil with a view of ultimately controlling the changes that take place, reducing the losses and increasing the production of ammonia or of nitrates.

The second line of investigation has to do with the possibility of the stimulation of plant growth as apart from plant nutrition. Is it possible to find substances which are not themselves nutrients but which will stimulate the plant to greater activity in assimilating the nutrients from the soil or in those photosynthetical processes that enable it to utilise the carbon dioxide of the atmosphere? This work is complicated by the difficulty of finding an exact definition for a nutrient on the one hand, and eliminating secondary effects on the other.

Lastly, investigations are being started on the influence of soil conditions (manures, etc.) on the composition of the crop. In England considerations of quality of the crop play a very prominent part; the feeding qualities of root and hay crops, the malting quality of barley, the baking quality of wheat being all matters of importance in determining the prices. Usually the ordinary analytical processes afford but little guidance to the chemist, and quality depends as a rule on some factors that have hitherto escaped us. As a first step in these investigations it has become necessary to ascertain more closely what substances are present in the crop and to what variations they are liable with change of conditions. This aspect of the work is being developed exhaustively, as it must form the basis of any true elucidation of the rather vague characters summed up in the word quality.

So much for the general outline of the recent Rothamsted work. We can now turn to details of some of the investigations. Considerable attention has been paid to the conditions under which the production of plant food, and especially of ammonia and nitrates, goes on. It has been shown that the process is mainly the work of bacteria, but that in normal soils the bacteria are not working at their maximum efficiency. A factor has been discovered limiting the numbers of bacteria and therefore the amount of decomposition they effect.

All the available evidence goes to show that this factor is biological: it is capable of growth, is put out of action by heat or antiseptics and can only be set up again by infection from outside: it does not, however, appear to consist of bacteria, and is provisionally identified with the protozoa, of which numbers have been found in all the soils examined. Partially sterilised soils from which the factor has been extinguished are found to contain larger numbers of bacteria than untreated soils and to accumulate ammonia and nitrates at a greater rate : they are, as might be expected, more productive. Methods are being worked out for applying this kind of soil treatment on the large scale, but instead of setting up a large number of field plots to discover some cheap and convenient process, the simpler alternative is adopted of inducing horticulturists who go in for intensive culture to adopt some of the methods known to work. This has proved very satisfactory and has led to a considerable cheapening of the method, besides revealing some of the difficulties attendant on its application on the large scale.

The laboratory investigations are proceeding on two lines. A number of obscure soil problems are being examined and cleared up in the light of this new conception of the existence of two opposing sets of organisms. For example, changes in soil temperature are known to have but little effect on the numbers of bacteria ; this has been traced to the presence of the detrimental organisms, for in partially sterilised soils from which they are absent the bacterial numbers show the normal change with changing temperature. " Sickness " in greenhouse soils and in sewage soils has afforded some interesting studies which have demonstrated that the detrimental organisms are an important factor in bringing it about. Indeed it seems to be a general rule that conditions favourable to active life in the soil may become unfavourable to productiveness through encouraging the detrimental organism, while conditions temporarily unfavourable to active life may be beneficial to productiveness through destroying them.

Further light has been thrown on the action of lime on the soil. It has been shown that dressings of lime sufficiently heavy to kill protozoa cause a marked increase in bacterial numbers and in the rate of production of plant food, the phenomena being entirely similar to those produced by other methods of partial sterilisation.

This new conception is proving very useful in clearing up old difficulties. A zoological survey of the soil fauna is being made by Mr. Goodey, and as the organisms are picked out they are studied to see whether it is likely that they could lead a trophic life in the soil or whether they are there only as cysts. A large number of organisms are being found and the work is evidently going to take considerable time, but it will we hope lead ultimately to the actual identification of the detrimental organisms.

The problem of nitrogen fixation is also under investigation. When land at Rothamsted is left in grass, or allowed to cover itself with wild vegetation, its percentage of nitrogen rapidly increases. How much is due to symbiotic fixation and how much to the free living Azotobacter is not easy to decide, but Dr. Hutchinson has shown that, under the conditions actually obtaining, Azotobacter can fix considerable quantities of nitrogen. The percentage of nitrogen present in a mixture of sand and crop residues increased when cultures of azotobacter and cellulose-decomposing organisms were added, but not otherwise. Growing plants were able to utilise the nitrogen thus fixed. Again, when sugar was added to some of the nitrogen-starved barley plots, an increased crop was obtained similar to that which a dressing of nitrogenous manure would have given. This results however, was only obtained when the sugar was added in the warm autumn weather ; in cold spring the sugar had a deleterious effect.

The gains and losses of nitrogen compounds by rain and drainage water have long been under investigation at Rothamsted. Analyses made on a systematic plan by Dr. Miller have shown the low amount of nitrogen compounds in rain collected at out-lying lighthouses, and the uniform and somewhat higher amount contained in rain collected in country districts. In towns, however, a larger quantity is present. About 4 lbs. of nitrogen per acre is thus brought down each year to the soil. The losses by drainage are much more serious. Lysimeter experiments continued over a period of 25 years and still going on, have shown that about 50 lbs. per acre of nitrogen compounds, chiefly nitrates, were lost each year in the drainage water for the earlier part of the period, and about 35 lbs. later on. The lysimeters are kept without crop or manure, and are uncultivated except in so far as is necessary to remove weeds. When last the percentage of nitrogen in the soil was determined, the loss of nitrogen was found to be practically equal within the error of experiment to the amount of nitrogen recovered in the drainage water. Under these conditions, therefore, the essential change in nitrogen compounds appears to be confined to ammonia production and nitrification. But on the cropped plots where large quantities of manure are added other losses appear to go on, which are now under investigation.

We now pass on to the plant work. The amount of growth a plant makes in a given soil is known to depend on the amount of food supplied, and this relationship forms the basis of the connection between the plant nutrition work and the soil work. But a hypothesis is current, and is backed by sufficient circumstantial evidence to make it worthy of consideration, that inorganic plant poisons act as stimulants to growth if supplied in sufficiently small quantities. If this hypothesis were well founded it would introduce a wholly new set of factors into plant nutrition relationships, and would, in addition, form a basis for important practical developments. Very careful water cultures have therefore been made by Dr. Winifred E. Brenchley to test this hypothesis as completely as possible. The compounds tested have been copper sulphate, manganese sulphate, zinc sulphate, sodium arsenite, arsenious acid and boric acid, and a wide range of concentrations has been adopted. Numerous plants have been tried, but on the whole barley and peas have proved most satisfactory. Copper sulphate was invariably toxic even in such high dilutions as 1 part of salt to ten million of water. The effect varied, however, with the plant and was somewhat masked in presence of nutrient salts. It is not entirely simple. The fact that boric acid decidedly increased the growth of peas, but never that of barley, raises the interesting question whether boron is in some way advantageous to the pea and therefore to be regarded as a nutrient. Some specific effect is clearly indicated and the hypothesis is shown not to hold in its general form.

Starting from the other end, *i. e.* from the soil, an attempt has been made to ascertain whether any toxins are thrown off from the roots of plants that will adversely affect succeding crops. A hypothesis to this effect has long been current, and has been defended by the United States Bureau of Soils. Plants have therefore been grown in succession in the same pots of soil, year after year, and their yields have been compared with those obtained when a rotation was adopted. The results were entirely negative and no systematic difference could be observed : we are forced to conclude that if any toxic property is developed in soil by the growth of a crop its effect is transient and does not persist long enough to affect a subsequent crop. So far our attempts to find toxins in the soil have resulted in failure.

An important piece of ecological work has been carried out by Dr. Brenchley, in tracing the relationship between the weeds of arable land and the soil and the crop. A definite association was found to exist between the weeds and the soil, the determining factor being, however, the texture of the soil rather than its geological origin, excepting only in the case of the chalk soils. The association was sometimes so close that it extended over a wide area ; thus *Euphorbia exigua* and *Ranunculus arvensis* were always seen on heavy loams or clays. Sometimes, however, the association is affected by climatic or other factors : thus *Matricaria inodora* was common on clay in Bedfordshire but absent near Bath. The two cases are distinguished as General and Local Association. Very few plants, however, could be said to be symptomatic of soil conditions in the sense of being restricted to any one type of soil ; but a good many plants are characteristic, *i. e.* are more frequently found associated with one soil than with any other. *Rumex Acetosella, Spergula arvensis* and *Scleranthus annuus* may be regarded as symptomatic of soils giving no carbonate reaction with dilute hydrochloric acid. A relationship also exists between the weeds and the crop : *Plantago lanceolata* and various species of *Geranium* are very common in temporary grasses ("seeds" crops), while *Poa annua, Polygonum auriculare* and *P. Convolvulus* are very rare. No doubt the conditions of cultivation account for this. It is surprising how many of the weeds belong to the *Compositae,* at least half the genera of this order providing species of weeds ; on the other hand *Rosaceae* and *Leguminosae* supply very few weeds.

The larger problem has been investigated of tracing the relationship between the system of agriculture practised and the soil types as characterised by mechanical and chemical analysis. The South Eastern portion of England was selected as the area of examination, and various correlations were traced between the analytical data and the properties of the soils. Consideration of these, however, is best deferred until the conclusion of similar surveys which are being undertaken in other parts of the country.

The third division of the work, dealing with the composition of crops, has only recently been undertaken. Mr. Davis has begun with the sugars and has made a careful survey of the methods in use for estimating them in plant products. The analytical difficulties are very considerable, and unsuspected sources of error have been revealed in some of the methods in use. In particular the necessity for using basic lead acetate in relatively large proportions for the purpose of eliminating amino-acids, tannins, etc., and the subsequent removal of the lead by sodium carbonate, gives rise to difficulties in estimating cane sugar because the sodium acetate thus formed protects it from inversion by weak acids. Objection can similarly be raised against other methods; but the progress that has been made up to the present fully justifies the hope that a satisfactory solution will be found of the various difficulties encountered.

In conclusion, it may be stated that no bulletins are issued from Rothamsted. The scientific papers dealing with Soil Fertility in any of its aspects, chemical or bacteriological, are published in the Journal of Agricultural Science: those dealing with the botanical side are published in the Annals of Botany. Papers intended for farmers are published in the Journal of the Board of Agriculture.

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The Present Organization of the Meteorological Service in Italy.

by

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In Italy the Meteorological Service is directed by the Royal Central Meteorological and Seismological Office in Rome, which depends from the Ministry of Agriculture, Industry and Commerce.

In a paper under the title of " Meteorology and Seismology ", which is one of the monographs collected in the work published under the auspices of the Government and of the R. Accademia dei Lincei on the fiftieth anniversary of the proclamation of the Kingdom of Italy (1), I had occasion to draw up the history of the Meteorological Service in Italy from its inception, through its successive stages of development, to its present form. In this paper I shall not refer to the past, but shall limit myself briefly to the actual state of the organization of our service.

State network of meteorological observatories. — The Government network consists of observatories, of temperature and rainfall stations and of simple rainfall stations. In the observatories observations are made of all the principal elements of climate : barometric pressure, temperature and moisture of the air, direction and velocity of the wind, cloudiness, cloud forms, and rainfall. The most important observatories possess, besides the usual non-recording instruments, the various apparatus that register pressure, temperature, hygrometric conditions (generally self-registering instruments of the Richard type are adopted), rainfall (Richard or Palazzo type), hours of sunshine (Campbell Stokes heliophanograph), wind (anemometroscopes registering by mechanical or electrical means, Brassart's types). The temperature and rainfall stations are provided only with rain-gages and maximum and minimum thermometers ; they record also the direction and estimated force of the wind and the state of the sky. Lastly, the rainfall stations limit themselves to observations on the fall of rain and of snow.

Many of the observatories are attached to higher or medium educational institutions, among which we include university astronomical observatories, which carry out as a rule also ordinary meteorological observations ; but the greatest number of the stations are conducted by private persons, schoolmasters, municipal secretaries, parish priests, monks, managers of estates, etc. The practical schools of agriculture also, but not all of them, have meteorological observatories, and the semaphores of the Royal Navy and the port captains' offices also forward meteorological data to the Central Office.

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(1) *Cinquanta anni di storia italiana* (1860-1910). Tip. della R. Acc. dei Lincei, Roma 1911.

The above-mentioned university observatories and the five Royal Seismical Observatories: Rocca di Papa, Ischia, Catania, Pavia and Salò, are supported by the State, as well as the mountain observatories on Monte Rosa, at Sestola-Cimone and at Tiriolo (Catanzaro), but beyond these three there are in Italy no other exclusively meteorological observatories, directly and entirely supported by the Government. A few of the observatories of the network are in receipt of subsidies from the Communes or Provinces; but on the whole it may be said that the service of our meteorological stations is performed gratuitously, inasmuch as the Government grants only small subsidies as compensation or for the upkeep of the observatories and which in no case can be considered as salaries for the persons entrusted with the observations.

In almost all the capitals of the provinces there is a principal observatory, the director of which has the high surveillance over the temperature and rainfall stations which form the provincial network.

According to a list drawn up on January 1, 1913, there are in Italy 177 observatories, 314 temperature and rainfall stations and 112 simple rainfall stations; these latter are established by the provincial offices of the State Civil Engineers and by improvement contractors and associations. Considering also about 30 stations belonging to agricultural schools, port authorities and semaphores, which register rainfall readings, the total number of rain-gages in Italy is at present 630.

As for the most part observatories and stations have been founded by private initiative, it was not to be expected that the distribution of our stations would be very uniform; indeed, while in several districts, like the valley of the Po and the Salentine peninsula the stations are very close to each other and sometimes more numerous than necessary, in other regions they are scarce. This, for instance, is the case in the province of Grosseto, in Calabria and in Sardinia. It would be especially desirable to have a greater number of stations for the record of rainfall particularly in the mountainous parts of the country, which would be very valuable for the study of the rivers and for the utilization of their water.

The Central Administration intends, as soon as the means at its disposal allow it, to increase by about five hundred the number of rain-gages, distributing them in those districts where they are least numerous.

The regulation hours for ordinary meteorological observations for our network of observatories are 9 a.m., 3 p. m. and 9 p.m.; besides which those observatories that have to send off telegrams in the morning for the weather forecasts, make their observations at 7 a.m. A few observatories and some semaphores take a supplementary observation at 11 a.m. and forward it by telegram to the Central Office.

The three observations of every day are written on special forms and are sent to the Central Office every ten days; while the temperature and rainfall stations use monthly forms, that is they are sent off at the end of every month. Similarly on the last day of each month the Offices of the State Civil Engineers send the Central Meteorological Office a copy of their rainfall readings.

Distribution of the duties in the Central Meteorological Office; Section of Climatology. — The Central Office, besides the Secretary's Office which attends exclusively to correspondence and to administrative affairs, has divided its work into five sections: Climatology, forecasts, agriculture and storms, physics, seismology. Every section is directed by a head meteorologist, a doctor in physical science, assisted by some technical officials or compilers, who are eight in number, all told; in truth they are too few and quite insufficient to meet requirements.

The duties of the climatological section consist in working up the data collected by all the observatories and meteorological stations of Italy, calculating the averages for the ten days, month and year, tabulating observations and publishing them in the *Annali dell' Ufficio centrale meteorologico e geodinamico*, of which more hereafter. The head of this section devotes himself especially to climatological studies and prepares monographs on the various elements of the climate of our country.

Telegraphic meteorological and weather forecast service. — The so-called weather forecast section draws up the daily telegram on the state of the weather and on its forecast, and attends to the preparation of the *Meteorological Bulletin* which is issued every day on lithographed sheets.

For this purpose the section receives the telegrams which forward the observations made expressly for it at 7 a. m. in 73 Italian observatories, besides similar observations of 54 foreign observatories. With these data the isobar and isotherm charts which serve as a base for the weather forecast are drawn up.

The Daily Meteorological Bulletin is published as a four-paged lithographed sheet, illustrated by three maps: one shows the isobars at 7 o' clock in the morning on Italy and on the neighbouring Mediterranean countries (the east of Spain, France, Switzerland, Austria, the Balkan peninsula, Algeria and Tunis) with graphical indications on the state of the sky and the sea, the rain, wind and storms; another one gives the isotherms at 7 a.m., also of the Mediterranean, with an account of the phenomena of the preceding 24 hours; and lastly another map on a smaller scale shows the isobars over the whole of Europe. In the three first pages of the sheet the meteorological information from the Italian observatories is given, grouped according to regions, and showing for each: the barometric pressure reduced to 0° C. and to sea level, and the difference from the readings of the previous day; the temperature and its difference from that of the preceding bulletin; the direction and strength of the wind, the state of the sky; the direction of the clouds, the state of the sea at the maritime stations; the maximum and minimum temperatures of the preceding 24 hours; the amount, in millimetres, of the rain or snow fallen in the same time; lastly, various observations referring to special events, such as storms, gales, rain, snow, hail, etc., with indications as to the time of day in which the above took place. The fourth page contains the above-mentioned small isobar map of Europe, the text of the meteorological telegram and a table of the meteorological data in the various States of Europe; as well as those in Algeria, Tunis, Malta, Alexandria and Tripoli.

The meteorological telegram is drawn up about one o'clock in the afternoon and a copy of it is sent to the Central Telegraph Office for transmission to the capitals of the provinces, to the semaphores and to the port captains' offices. In this telegram a notice is given of the positions of the barometric maxima and minima over Europe; it contains also a summary of the weather in Italy during the preceding 24 hours and the meteorological conditions of the morning in Italy, the distribution of pressures and lastly the weather forecast. This forecast is intended generally for the next 24 hours. When storms at sea are expected, telegrams are sent as soon as possible to the semaphores and ports in order that the storm signals agreed upon by maritime conventions may be hoisted along the threatened shores.

The bulletin is lithographed and appears before the evening; it is sent by post to the Italian observatories, to many Government offices and public administrations free of charge; it is also sent in exchange to foreign meteorological institutions. There are also private subscribers to the Bulletin, who pay 16 Lire (12*s.* 8*d.*) per annum in Italy and 30 Lire (23*s.* 9*d.*) abroad.

Extracts from our bulletin are published in the *Gazzetta ufficiale del Regno*, as well as in the chief newspapers, often together with a small table containing the data collected at the Royal Astronomical Observatory of the Collegio Romano.

Lastly the telegraphic and weather forecast section of our Office attends to the international service consisting in forwarding telegraphically from Italy the meteorological data of a certain number of Italian stations, selected for the purpose, to the following foreign central meteorological offices and observatories: Paris, St. Petersburg, Triest, Vienna, Zürich, Hamburg, Athens, Madrid, Pola, Budapest, Sofia and Malta.

Agricultural and thunderstorm service; Meteorico-agricultural Review. — One section of the Office has the duty of collecting, ordering and working up the information concerning the thunderstorms which break out in Italy. This information reaches the Office by special uniform forms printed on cards which are filled in by the directors of the observatories and of the temperature and rainfall stations of the Government network and by other willing correspondents. On the basis of the observations thus collected the head of the section studies and draws up statistics concerning thunderstorms and hail in Italy, their distribution according to localities and seasons, their connection with the other elements of climate, etc. Besides which the present chief of the section is engaged on various kinds of research work connected with atmospheric electricity.

The same section attends also to the agricultural service, which consists in collecting and making extracts from special cards which are sent in by most observatories every ten days with brief news on the extreme temperatures, the cloudiness of the sky, the rainfall, with the addition of special information on the state of the fields, on the various crops and on the general progress of farming operations. With the help of this intelligence the *Meteorologico-agricultural Review*, which is published every ten days, is compiled. The Review includes a summary of the pressure in Europe and of the meteorology of each of the ten days in Italy; a recapitulation of the agricultural news for each of the regions of Italy, followed by another short summary for the whole of Italy; lastly the detailed information which reaches the Office by means of the cards of the various observatories, grouped according to regions and provinces. In the review a small map showing the true isotherms and the distribution of rain in Italy during the ten-day period is also published; sometimes, as an appendix, brief meteorological notes written by various authors are added.

Physical service ; magnetic chart of Italy. — The physical section of the Office deals with the examination and testing of the different meteorological apparatus which have to be sent to the observatories. The section has for this purpose a small physical laboratory, provided with the necessary instruments for measuring, and especially for testing thermometers and mercury and aneroid barometers. Besides which the assistant carries out research work on the physics of the atmosphere and of the earth.

In describing the distribution of the various branches of the Central Office the *seismological section* was mentioned. As its name implies, it deals with the study of earthquakes in Italy and with the publication of intelligence respecting them. But we cannot enter more fully upon this subject, as for the special nature of the periodical in which this paper appears the latter must limit itself to the subject of the organization of the meteorological service.

Publications of the Royal Central Office. — In the foregoing we have mentioned the official publications of our meteorological service, namely the daily *Meteorological Bulletin, the Meteorologico-agricultural Review*, which is issued every ten days, and the *Annals*. We will add a few words on the latter, which are the most important organ of publication of the Central Office.

In general, every volume of the Annals, corresponding to one year, is divided into three parts. The first part contains papers and original works by the scientific staff attached to the Office, and by other Italian meteorologists and students of physics of the earth. The second part is devoted to the publication of meteorological data collected by all the Italian observatories and worked up by the climatological service of the Office, as has already been stated. The third part contains similarly the data furnished by the temperature and rainfall and by the rainfall stations. Thus the second and third parts considered together form a valuable collection of meteorological data which can be used as a foundation for any study on the climate of Italy; while the first parts have included several important publications of a synthetic character on special elements of our climate, such as rainfall and temperature; papers on the other factors are being prepared. We attach special importance to these researches on the climate, inasmuch as they represent that part of the meteorological State service which has more directly practical ends in view and which admits of immediate application to social economics, to hygiene and to agriculture.

In this connection it may be mentioned that the General Direction of Statistics publishes every two or three years in the *Annuario Statistico Italiano* a series of tables showing the averages, for a certain number of Italian cities, of the climatic factors, drawn from the observations of many years, for which work the material collected by our Office is made use of.

Managing Board of the Meteorological and Seismological Service. — In order to complete the information on the organization of the Meteorological Service in Italy, the managing board has to be mentioned. It is the highest authority which superintends the whole of the service; it draws up resolutions, advises on the general measures to be taken, decides on the installation of new observatories, etc. All the more important questions, and those which entail greater responsibility in matters of administration and estimates, are submitted to this Board, which usually holds its session, which lasts several days, once a year. The Director of the Office reports to it upon his management. The Board is composed of six members besides the director; two of them represent the Ministry of Agriculture and one each the Ministries of Public Instruction, Marine, Public Works, and Posts and Telegraphs, which are the most interested in the meteorological service.

Italian Meteorological Society. — In Italy there exists, as in other countries, a Meteorological Society, which stimulates meteorological work, awakens interest in it and promotes the institution of new stations; its organ is the *Bollettino Bimensuale*, in which short papers, and meteorological intelligence and data appear. The Society's network cannot be considered as distinct from that of the State, as owing to the excellent relations existing between the President of the Society, Count Antonio Cittadella Vigodarzere, and the Director of the Royal Central Office of Meteorology, the stations which have been founded by the Society lend their services in the general interest and send copies of their data to the Central Office.

Manuring of Sugar Beets.
Present State of the Question in Germany.

by

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In Germany the only breeds of beets that are grown are those of Klein-Wanzleben origin, as this variety has proved superior to all others.

Anong the crops raised in Germany, the sugar beet is the one that gives the heaviest yields on the better class of soils. Thus where under the most favourable conditions with wheat and potatoes about 80 cwt. of dry matter are produced per acre, a sugar beet crop, under the same conditions, yields from 128 to 135 cwt. of dry matter per acre, exceeding even a crop of mangels. It is therefore evident that sugar beets require especially large quantities of plant food for their development. The greater part of this plant food is derived, under normal conditions, from the soil, the lesser from the manures.

Farmyard manure. — Like all root crops, beets are especially responsive to farmyard manure, by means of which notable increases of yield are obtained. Thus at the Lauchstädt experiment farm the following increases per acre were obtained as average of several years(1):

	Roots cwt.	Sugar cwt.	Leaves cwt.
With 12 tons farmyard manure	84.4	14.6	120.2
„ 8 tons „ „	71.2	12.9	81.3

Further, the yearly experiments at Lauchstädt show that the highest yields of sugar beets can not be obtained without farmyard manure. The yearly averages were (2):

	Cwt. per acre		
	Roots	Sugar	Leaves
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit	348.6	60.26	232.35
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit and stall-pit manure	425.0	70.18	292.02
4.0 cwt. nitrate 0.8 cwt. phosphoric acid 8.0 cwt. kainit and farmyard manure	400.7	68.20	292.25

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(1) VII. Report of the Experiment Farm at Lauchstädt, p. 41. *Landw. Jahrbücher*, 1910. *(Author's note).*

(2) IV. Report of the Experiment Farm at Lauchstädt: 1902, pp. 18-19. *Landw. Jahrbücher*, 1902. *(Author's note).*

From this it is seen that the heaviest crops cannot be obtained from artificials alone, even when given in maximum dressings. With these, the maximum crop was 349 cwt. per acre, while with the addition of farmyard manure 400 and 425 cwt. per acre were reached.

Considering the exceedingly favourable effect of farmyard manure on sugar beets, the farmer should use his available stock of this fertiliser as much as possible for beets. The most favourable quantity to be given may be set down at 8 to 12 tons at most per acre.

Green manuring. — To this form of manuring also sugar beets are very responsive, so that it is advantageous when circumstances allow it to grow sugar beets on green manure. At Lauchstädt the average of several years shows the increase of crop due to green manuring to be 47.8 cwt. of beets with 7.61 cwt. of sugar per acre(1).

The percentage of sugar was not perceptibly diminished by the green manure. If stable manure is given together with the green manure the former must not be applied too abundantly or a great waste of nitrogen would ensue, and the excess of manure would cause a greater diminution in the sugar content percentage.

Artificial manures. — *a*) *Nitrogenous manures.* — Among these the most important are nitrate of soda, sulphate of ammonia and the compounds obtained by electro-chemical processes, namely Norwegian nitrate of lime and calcium cyanamide. Sugar beets utilize best of all the nitrates, the action of which, under normal conditions, is not equalled by any other form of nitrogen, or even by sulphate of ammonia. The latter should be used only when a very heavy nitrogenous dressing is intended, which in the form of nitrate is likely to promote caking of the surface of the soil. In this case a combination of manures is advisable, giving one half of the nitrogen as a mixture of sulphate of ammonia and superphosphate ("ammoniaksuperphosphat") in preparing the land and the other half in the form of nitrate as top-dressing. Instead of nitrate of soda the Norwegian nitrate of lime may be used, as many experiments(2) prove that it may be considered to be equal in value to nitrate of soda. Calcium cyanamide is not so advisable for sugar beets, at least on light soils(3). If, on account of its lower price, it is to be used on better soils it should be applied with nitrate.

As for the amount of nitrogen to be given, the following may be considered as normal quantities:

Without farmyard manure	3.2 to 4.0 cwt. nitrate
With farmyard manure or green manure	1.6 to 2.4 cwt. nitrate

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(1) V. Report of the Experiment Farm at Lauchstädt: 1904, p. 34. *Landw. Jahrbücher*, 1904. (*Author's note*).

(2) *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 146 and 217. (*Author's note*).

(3) *Ibid.* (*Author's note*).

In the first case, if caking of the surface is to be feared, a part of the nitrate should be replaced by sulphate of ammonia (ammoniacal superphosphate).

It is well known that it is not advantageous to give heavy dressings of nitrate all at once when the seed is sown, but that it is preferable to divide the quantity in several portions, the last of which is generally given not later than June 20, and on light soils at the beginning of June.

b) *Phosphatic manures.* — Beets show a decided preference for the water-soluble phosphoric acid contained in superphosphates as compared with the less soluble phosphoric acid of basic slag. They especially require during the earliest stages of growth a certain quantity of easily assimilable phosphoric acid, so that superphosphates are always the best form to be used in the better kind of soils, and also on light soils it is advisable to give a portion of the phosphoric acid under the easily assimilable form of superphosphates.

The amount of phosphoric acid to be given, independently of the nature of the soil, depends chiefly upon the amount of farmyard manure that is used. The local farmyard manure contains an average of about 0.4 per cent. of phosphoric acid, so that a dressing of 8 tons per acre contains about 72 lbs. of phosphoric acid, which, as the Lauchstädt experiments show, has a most favourable effect, especially when the manure is the result of rich food. Anyhow, and this is proved by other experiments, the amount of phosphoric acid to be given may be considerably reduced if farmyard manure is used at the same time(1). The following may be considered normal quantities per acre :

Without farmyard manure	3.2 to 4 cwt.
With " "	1.6 to 2.4 cwt.

c) *Potash salts.* — Sugar beets, like mangels and potatoes, are typical potash plants, but owing to their highly developed root system they possess to a greater degree than mangels and much more than potatoes the power of taking up potash from the soil. For this reason potash manures do not cause such high increases of yield with the sugar beet as they do with mangels or potatoes.

The amount of potash manures to be given depends, as in the case of phosphatic manures, chiefly upon the quantities of farmyard manure used. The latter contains an average of 0.7 per cent. of potash, so that with a dressing of 8 tons per acre, 125 lbs. of potash are given, namely as much as is contained in 8.76 cwt. of kainit. Consequently, when medium and heavy farmyard manure dressings are given to the better kinds of land, a special application of potash is often not necessary(1), while on light soils an addition of potash would not be out of place.

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(1) Reports of the Lauchstädt Experiment Farm. (*Author's note*).

Among the Stassfurt potash salts those most frequently used are kainit, sylvinit and "Hartsalz" (the two latter generally going also under the name of kainit) and the 40 per cent. potash salt. The amount of potash contained in 1 cwt. of 40 per cent. potash salt is the same as that in 3¼ cwt. of kainit. For plants which, like beets, respond to the other salts contained in kainit, 2 cwt. of kainit may be considered equivalent to 1 cwt. of the 40 per cent. potash salt. The following quantities per acre may be recommended:

Without farmyard manure, 4.8 to 6.4 cwt. of kainit or 2.4 cwt. of 40 per cent. potash salt; with farmyard manure, 0 to 4.8 cwt. kainit or 0 to 1.6 cwt. of 40 per cent. potash salt.

For applying this, the autumn is preferable to the spring, and on the better kinds of soils 40 per cent. potash salt is to be chosen.

The use of phonolite is to be strongly deprecated.

Influence of manuring on the quality of the beets. Influence of nitrogenous manures. — Every application of nitrogenous manures causes a certain decrease in the percentage of sugar. But with the improved varieties of beets which we grow now this decrease is not so considerable as to cause nitrogenous manures to be feared. The average diminution of sugar content observed during a long seies of years was as follows: (1).

With	green manuring	— 0.20	per cent. of the beet
,,	farm yard manure, 16 tons per acre	— 0.39	,, ,,
,,	stall-pit manure, 16 tons per acre	— 0.57	,, ,,
,,	nitrate of soda, 4 cwt. per acre	— 0.50	,, ,,

Thus, even with these heavy dressings the decrease in the percentage of sugar was not considerable.

In numerous experiments on beets carried out in the province of Saxony on various kinds of soil, in which 1.6 to 3.2 cwt. of nitrate per acre and other nitrogenous manures containing corresponding quantities of nitrogen were used, no depression in the sugar content was observed (2):

Without nitrogen	17.1	per cent. of sugar in the beet
With nitrate of soda	17.2	,, ,, ,,
With sulphate of ammonia	17.3	,, ,, ,,
With cyanamide	17.3	,, ,, ,,

It is thus ascertained that our recent resistant beet varieties can stand relatively high quantities of nitrogen without any consequent diminution of sugar worth mentioning.

Top dressings can also be carried out without hesitation provided they be applied not later than the 20th of June. The average sugar content observed during several years was the following (3):

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(1) II. Report of the Experiment Farm at Lauchstädt: 1907, p. 26. *Landw. Jahrbücher*, 1907. (*Author's note*).

(2) *Arbeiten der deutschen Landw.-Gesellschaft*, Part 146, p. 115. (*Author's note*).

(3) *Loc. cit.*, p. 113. (*Author's note*).

	3.2 cwt. nitrate per acre (the whole given at seeding time)	3.2 cwt. nitrate per acre (1.6 cwt. at seeding and 1.6 cwt. as top-dressing up to June 20)
Sandy soil	17.25	17.15
Sandy loam	16.10	16.25
Loam	18.15	18.05
Clay loam	17.25	17.20
Average	17.19	17.21

Consequently the practice of dividing large applications of nitrate of soda, where it seems advantageous, can be safely recommended, bearing in mind, however, that in general the last application must not be given later than June 20. On light soils, where the beet closes its period of growth earlier, the top-dressings must be given betimes.

Influence of phosphatic manuring. — It is still believed by many that phosphoric acid increases the sugar content of beets; but in reality, under normal conditions, this is not the case, as is proved beyond doubt by the following:

1. The accurate experiments of Hellriegel, which demonstrated that the lack of phosphoric acid diminished the amount of the crop, but never the percentage of sugar in the beets.
2. Numerous field experiments.

Thus, for instance, at Lauchstädt the percentage of sugar was as follows:

	Percentage of sugar in the beets
Average of 11 years without phosphoric acid	17.60
Average of 11 years with phosphoric acid	17.58

When the beets were not harvested too early, those manured with phosphoric acid never showed a higher sugar content than those grown without phosphatic manures. Matters are somewhat different when the harvest is very early and on soils under less favourable climatic conditions where the beets mature too slowly.

Influence of potash manures. — With the old varieties of beets, potash manures always produced a depression in the sugar content, while with the new improved sorts, the contrary is the case, as numerous experiments testify(1).

The *ash content* of the new improved beets is not sensibly increased by heavy manuring. Thus the average ash content obtained from several experiments at Lauchstädt was the following:

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(1) *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 56, 67, 81 and 193. (*Author's note*).

Manure per acre	Percentage of pure ash in dry matter
Without manure	1.89
4.8 cwt. nitrate, 0.8 cwt. phosphoric acid, farmyard manure	2.07
12 tons farmyard manure	1.98
12 tons farmyard manure, 3.2 cwt. nitrate, 0.8 cwt. phosphoric acid, 1 cwt. potash	2.39

A certain increase of ash due to the manure cannot be denied, but it is so small that it does not cause any great difficulty in working up the beets in the factories, especially as such heavy manuring as that given in the above experiments is rarely resorted to in practice. According to these investigations the dry matter of the new beet varieties contains only about 2 per cent. of pure ash, while up to the year 1880 the average percentage of ash in the dry matter of sugar beets was 3.84(1), or nearly twice as much as that contained in the new improved varieties. This is explained by the fact that for the production of our new varieties the beets richest in sugar have always been selected and such beets have always possessed a low ash content. Thus, without its being known, a low ash content has been inherited together with a high sugar content. Our present improved beets do not take less plant food from the soil and manure than the old ones did ; on the contrary, they take up quite as much plant food, but store it up much less in the roots than in their strongly developed leaves.

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(1) Mentzel and von Lengerkes *Landw. Kalender*, Paul Parey. Berlin.
(*Author's note*).

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTATIVE MEASURES

202 - **Government Crop Reports: Their Value, Scope and Preparation.** *U. S. Department of Agriculture, Bureau of Statistics, Circular 17.* Washington, November 1911.

The collection of agricultural statistics in the United States was first authorized by an Act passed May 15, 1862. In the following year a part of the appropriation for the Department of Agriculture was allotted for the work of collecting agricultural statistics; in 1865 $ 20 000 (£4113) were appropriated for this object. Since then the crop reporting service has been perfected and enlarged into the Bureau of Statistics; in the fiscal year 1912 the appropriations for this Bureau amounted to $ 232 000 (£47 721).

The data upon which the reports relating to agricultural conditions are based are obtained from State statistical agents and from voluntary correspondents.

Among the former there are 20 travelling agents, especially qualified by statistical training and practical knowledge of crops. They systematically travel over the districts assigned to them and note the development of each crop, keep in touch with best informed opinion and send in written and telegraphic reports monthly. There are besides 47 State statistical agents located in different States. Each receives the reports of correspondents in the different parts of the State, which he then coordinates and analyses in the light of his personal knowledge of conditions and prepares his report for his State to the department.

Independently of the above, there is, in each of the 2800 counties of agricultural importance in the United States, a principal county correspondent, who, with the aid of several assistants, prepares the reports for his county which he sends direct to Washington.

Further, the department receives reports direct from about 32 000 township correspondents located in the townships in which farming operations are extensively carried on.

Finally a large number of individual farmers and planters report on the results of their own individual farming operations during the year; valuable data are also secured from 30 000 mills and elevators.

With regard to cotton, the information from the foregoing sources is supplemented by that furnished by special cotton correspondents, and in addition enquiries in relation to acreage and yield per acre of cotton are addressed to the cotton ginners on the list of the Census Bureau.

From the time of planting up to that of harvesting, data are gathered and reports made as to the condition of each of the principal agricultural products; a normal condition of 100 is that of the plant where it gives promise of a good average crop provided it is not subjected to damaging influences. Condition reports, expressed in percentages of a normal, are coupled with a statement of the averages (usually ten-year averages) of similar reports at corresponding dates. At harvest time the yields per acre are ascertained; these being multiplied by the acreage figures already ascertained give the production figures for the year. Further, the causes of injury to the crops, the estimation of the value of the crops, the market prices, etc., are also frequently given.

The several employés send their reports separately and independently to the department at Washington.

In order to prevent any possible access to reports which relate to speculative crops, all of the reports from the State statistical agents as well as those from the special field agents are sent to the Secretary of Agriculture in specially prepared envelopes, which are delivered in sealed mail pouches. These pouches are opened only by the Secretary or Assistant Secretary, and the reports with seals unbroken are kept in a safe in the Secretary's office until the day when they are delivered to the statistician. The combination for opening the safe is known only to the Secretary and the Assistant Secretary of Agriculture. Reports from special field agents and State statistical agents residing at points more than 500 miles from Washington are sent by telegraph in cipher. The reports from the county and township correspondents and other voluntary agents are sent to the chief of the Bureau of statistics by mail in sealed envelopes.

A board composed of five members, which are changed every month, draws up the final crop estimates from the reports and telegrams sent in, for each State separately and for the whole of the United States. This board meets in the office of the statistician; they open the reports which till then have been kept sealed; each individual member computes independently his own estimate in a general report for each State. These reports are then compared and discussed and the final figures are decided upon.

Reports in relation to cotton are issued on the first or second day of each month, and reports relating to the principal farm crops and live stock on the seventh or eighth day of each month.

In order that these reports may be made available simultaneously throughout the entire United States they are handed at the same time on report days to all applicants and to the Western Union Telegraph Co. and the Postal Telegraph Cable Co., who have branch offices in the Department of Agriculture and who reserve their lines at the designated time for transmission to the exchanges and to the press. The same day cards containing the essential facts concerning the most important crops are mailed to the 77 000 post offices throughout the United States for public display.

Promptly after the issuing of the report, it is published in the Crop Reporter. An edition of over 165 000 copies is distributed throughout the whole country.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

203 - Agricultural Possibilities of Benadir, Italian Somaliland.

ONOR, ROMOLO. Appunti di agricoltura benadiriana. — *Ministero delle Colonie, Direzione centrale degli Affari coloniali, Ufficio di studi coloniali. Monografie e rapporti coloniali.* No. 1, pp. 62 + 15 figs. Rome, January 1913.

General considerations on the climate, rivers and soils of Benadir; description of experimental cultivations carried out by the writer at Caitoi and conclusions on the agricultural possibilities of the colony.

Climate. — The Somali year is divided into 4 periods : *Gu* (100 days : beginning of March to the beginning of June) ; *Hagái* (60 days : beginning of June to beginning of August) ; *Der* (100 days : beginning of August to end of November) ; *Gilál* (100 days : end of November to beginning of March).

The temperature is uniform throughout the year - at Caitoi in the hottest period the daily temperature ranged between 17° and 35° C. The regulating factor of plant life is essentially water. Gu and Der are the rainy seasons, the first being usually the period of most abundant rain ; during Hagái, sometimes, but not always, there are some slight irregular rains ; Gilál is the dry season, but not absolutely so as sometimes light rains occur in December. In 1911 the rainfall at Caitoi amounted to 330 millimetres (13 inches).

Rivers. — The Juba has one chief flood-time, from the beginning of October to the middle of December, and a smaller flood after April : In the first period in many districts it is possible to deviate water from it either directly or by raising it to a slight height, while in the second it would have to be raised considerably, except in the last 9 miles of its course up to which point the action of the tides is felt. The Uebi Scebeli behaves very similarly : its small flood however is much more abundant so that it also would allow of water being derived directly from it. In view of the very great quantity of silt carried by the river water it might perhaps be possible to improve certain districts by warping. Compared with Nile silt, the material carried down by the Uebi Scebeli is richer in organic matter and potash, not so rich in phosphoric acid and nitrogen, and very much poorer in calcium compounds. A sample taken at Caitoi gave the following results on analysis :

	Per thousand		Per thousand
Coarse particles	20	Calcium compounds	2.5
Fine earth (below 1 mm.)	980	Total P_2O_5	2.
Moisture	68.2	K_2O soluble in 25 % HCl	6.5
Organic matter (loss on ignition)	140	Nitrogen	0.9

By the hydraulic method. Velocity of current 0,2 mm. per second.

gross sand . . .	750
clay	250

Soils. — In the districts which, it seems, will be colonized first, the soils are excellent and very deep. Some soils of Somaliland are salty, but not to such an extent as to cause serious inconvenience ; in fact at Caitoi cotton was not affected by it at all ; besides, in Somaliland those plants which characterize alkali lands are wanting.

In the analyses referred to here below, No. 1 is a sample taken in the experimental field of Caitoi at the depth of about one foot. No. 2 is a sample taken from the upper layer of the sides of a canal which showed abundant efflorescences.

	No. 1	No. 2
Dry soil at 105°C.	94.5 per cent.	96.2 per cent.
Soluble salts	5.5 »	3.8 »
Soluble sulphates	2.5 »	1.5 »
Chlorides and carbonates	Traces	

Experimental cultures. Cotton. — The varieties tested were : the native cotton which has a short and not very abundant lint, but is resistant to drought and to disease ; the Egyptian varieties (Afifi, Sakellaridi and Abassi) ; Upland and Caravonica.

The Egyptian cottons gave satisgactory results. Their period of vegetation lasted about 140 days. In plots that were never irrigated, cotton sowed in the middle of May succeeded perfectly with about 150 mm. (6 inches) of rain (up to October). In plots sown during the first ten days of June one irrigation before sowing and the rain that fell during July (55.75 mm. = 2.19 inches) were sufficient. The soil was worked to a depth of 10 inches, weeding was done four times. Though attacked by parasites Afifi yielded on 1.43 acres at the rate of 795 lbs. of ginned cotton per acre, an excellent crop.

Caravonica cotton attained exceptional dimensions and proved very resistant to drought

Both for Egyptian and for Upland cotton it was found that a plentiful supply of water at the moment of sowing and an abundant rain or irrigation about 45 days later were sufficient to ensure the crop. Consequently, without considering the rainfall, Upland cotton can be sown at the beginning of the Scebeli flood, from the end of August ; and at the rise of the Juba flood about the first days or the middle of October. The sowing of cotton of the Egyptian type is possible from the end of April to the beginning of June on the Scebeli, and on the Juba, wherever it will be found profitable to raise water for purposes of irrigation.

During the autumn floods of the two rivers (*Der*) the production of Egyptian cotton, using irrigation water, seems possible on the Scebeli and perhaps also in many districts of the Juba. Though on account of the shorter duration of the flood of this river it is probable that Upland cotton, having a shorter period of vegetation, will prove more advantageous

Cotton at Caitoi has been found to be damaged by the following: The strong south-west monsoon in May and June, which produces curling and blackening of the edges of the young leaves; *Oxycarenis* (*hyalipennis*?); two varieties of *Disdercus*; the much more injurious *Heliothis* (*armiger or peltiger*?); *Gelechia gossypiella*, and some small green cicadas which collect on the lower surface of the leaves which they bore with their suckers causing them to become blistered and wrinkled; they do not do much damage to adult plants, but injure the young ones.

Tobacco. — The local production in Benadir is insignificant, and the importation from Zanzibar and Arabia amounted in 1911 to 214 952 lbs., worth £5974.

From his experiments the writer concludes that in Benadir two successive tobacco crops can be produced in the course of a year, the first being planted from the end of April to the beginning of June, the other from the beginning of September onwards, that is when water is available. Under normal conditions, the seedbeds give seedlings ready for setting out in about 40 days. The duration of vegetation from planting out to harvesting is 80 to 90 days. For the full development of the plants one irrigation before sowing, at the beginning of June, and 55.75 mm. (2.19 inches) of rainfall in the second half of June were sufficient for the first crop, and for the second one irrigation (September 8) before sowing and 134 mm. (5.27 in.) of rain towards the middle of November. By cutting the plants down to the ground immediately after the harvest a secondary crop is obtained which under favourable circumstances may amount to one-half of the principal crop. Eastern tobaccos attain a great development, producing large leaves with coarse ribs.

Maize. — Maize is the chief native crop of the region of the middle Scebeli. As with tobacco, two crops a year may be obtained, by sowing from the end of April to the beginning of June and from September onwards. In the writer's experiment the duration of vegetation was about 100 days for the spring varieties , and 80 days for the early varieties.

Sesamum. — It is cultivated to a great extent in the places where water stagnates for a length of time. At Caitoi it produced 8.4 cwt. of clean seed per acre.

Earthnuts. — They ripened in 170 days from the date of sowing and yielded 231 cwt. of dry nuts per acre.

Lucerne. — It succeeded very well and resisted prolonged drought, producing in three cuts 67 cwt. of hay per acre.

Besides the above, experiments have been commenced with *Manihot glaziovii*, kapok (*Eriodendron aufractuosum*), coconut palms, and several woody plants. As suitable for hedges the writer recommends *Euphorbia Lemaireana*, *Jatropha Curcas*, *Euphorbia Tirucalli*, *Parkinsonia aculeata*, *Cassia florida*, *Bixa Orellana*, and *Cajanus indicus*. For moist soils he advises growing bamboos, especially the large species *Dendrocalamus giganteus* and *D. strictus*.

204 – The Agricultural Development of Madagascar.

Madagascar et Dépendences. I. L'Agriculture et l'Élevage. II. La Sylviculture. — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 61, pp. 7-10. Melun, January 1913.

European agricultural colonization is in full progress in Madagascar, where 252 790 acres were under cultivation in 1912, as against 105 270 in 1911. The agricultural production has increased from 52 950 to 110 700 tons. The increase is chiefly in crops of poor quality, which were little grown or not grown at all, in the preceding years, such as manioc, maize, kitchen garden produce, etc. Consequently the value of the crops does not increase in proportion to the area under cultivation, and is only £244 000 as against £222 100. The value of the agricultural production will, however, soon increase when the important plantations of vanilla, coffee, cacao, coconuts and ylang-ylang, which have developed much of late years, are in full bearing.

Coffee is one of the important cultivations and the plantations of this are extending most. It is calculated that the number of shrubs in the province of Mananjary alone will soon reach one million.

In 1912, the natives had 1 930 000 acres under cultivation, as against 1 660 500 in the preceding year. The Malagasy grow chiefly rice, but also much manioc and maize. On the volcanic soils of Vakinankaratra; barley and wheat are raised ; at the present time clove trees are grown on 2700 acres, coconut palms on 2500 acres and coffee on 1100 acres ; while 566 acres are under cotton and 882 acres under vanilla.

The live stock of the colony consists of 1968 horses and mules and 5 330 209 cattle ; to the latter must be added the by no means inconsiderable number of wild cattle, which live in the desert zones of the west. The flock of ostriches belonging to the colony has now risen to more than 500 birds, while their number in 1910 was only 319. Crossing experiments have been attempted with ostriches from Abyssinia.

The Forestry Service of Madagascar has been occupied for several years in protecting the forests ; these have suffered greatly from fires and from the native custom of sacrificing a wood to make "tavy" (rice plantations), as well as from intensive exploitation. The Administration has directed its efforts to the reconstitution of the forests which have been destroyed, by planting native trees, and has also turned its attention to the creation of uniform stands by acclimatizing rapidly-growing trees of general usage.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTR

205 – A Retrospect of the Scholastic Year 1911-12 in the Agricultural and Forestry Schools and Colleges in Austria (1).

Rückblick auf das Schuljahr 1911-12 an den land- und forstwirtschaftlichen Lehranstalten in Oesterreich. — *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVI, Parts III and IV, pp. 239-265. Vienna, 1912.

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(1) This report does not include the Agricultural High Schools in Vienna, nor the Agricultural Institutes of the University. (*Ed.*).

The three agricultural Colleges of Austria were attended, during the scholastic year 1911-12, by 350 students; of these 166 went to Tabor College, 72 to Tetschen-Liebwerd College, and 112 to Dublany College. At the Brewing Industry College in Vienna, 18 students were entered. The following table gives a review of the attendance of the Intermediate Ariculture Schools.

Intermediate Agricultural School in	Number of Students			
	I	II	III	Total
	Year			
Mödling	44	41	37	122
Chrudim	82	76	78	236
Kaaden	89	82	64	235
Raudnitz	91	73	44	208
Kloster-Hradisch	33	—	—	33
Neutitschein	32	28	22	82
Prerau	35	59	47	141
Oberhermsdorf	33	13	15	61
Czernichów	24	14	18	56
Total	—	—	—	1174

A ministerial decree of May 21, 1912, made an alteration in the final examination of these intermediate schools; the subjects of the written examination being now chiefly agricultural practice, crop cultivation, and stock raising, while the oral examination includes also questions on implements and machinery. Formerly, the students of both the written and oral examinations included the four above-mentioned branches, and in addition, agricultural-chemical technology and land-improvement.

The Higher School for Fruit-growing and Wine-making at Klosterneuburg, and the Higher School for Fruit-growing and Horticulture at Eisgrub had during the last session 57 regular students and 16 occasional students, and 43 regular students and 2 occasional students respectively.

The number of students attending the Higher Forestry Schools were as follows:

	I	II	III	Total
	Year			
Brück a. d. Mur	15	11	14	40
Pisek (two years' course)	30	51	—	81
Reichstadt	40	29	25	94
Mährisch-Weisskirchen	28	28	17	73
Lemberg	45	39	26	110
Total	—	—	—	398

The number of students attending the 42 Austrian Agricultural Schools in the session 1911-12 was 1498. The Agricultural School for Women at Otterbach, opened in 1911, had 16 students during its first year.

In the winter half-year 1911-12, 3127 students in all attended the 88 Winter Agricultural Schools established in Austria ; that is an average of 35 to 36 students per school. During the official year , there were held 17 Summer Housekeeping Schools, attached to the winter-schools ; they were well attended.

The 10 Lower Forestry Schools had a total of 405 scholars. The report for the official year gives the following numbers for the 4 Dairy Schools : at Doren 11, at Friedland 23 for the winter course and 20 for the summer course, at Kremsier and Rzeszów 12 each and at the latter also 6 occasional students and 29 for practical work only.

In the 20 Agricultural Housekeeping Schools there were 763 women students, while 323 attended the 17 Summer Housekeeping Courses.

Of the special agricultural schools during the session 1911-12, the 11 Schools for Fruit-growing and Wine-making had an attendance of 297 and the 8 Horticultural Schools of 162 students. The course on Alpine Economy at Grabnerhof was attended by 135 students during the calendar year 1911 ; while the Schools of Meadow Cultivation at Eger and Hohenmuth were each attended by 13 students during the official year 1911-12. The attendance at the School for the Cultivation of Hops and Vegetables at Saaz was 36, while 27 students attended the School for the Preparation of Flax at Saar. The Vegetable Cultivation School at Zábreh had 116 and the Hop-growing School at Brody, 6 students.

The courses of the Austrian Beekeeping School in Vienna were well attended. Of the 4 lower schools of instruction in the fermentation industry, the Brewery School at Mödling was closed owing to the small attendance. The other 3, the Brewery School in Prague and the Distilling Schools at Königliche Weinberge and Dublany, had 84, 27 and 20 students respectively.

206 - New Regulations Affecting the Study of Agriculture at the University of Cracow.

Neue Bestimmungen für das Studium der Landwirtschaft an der k. k. Universität in Krakau. — *Land- und Forstwirtschaftliche Unterrichtszeitung*, Year CXXVI, Parts III and IV, pp. 161-168. Vienna, 1912.

Since 1890, the philosophical faculty of the University of Cracow has included a department for the study of agriculture. The hitherto provisional arrangements of the curriculum and examination subjects of this department have undergone changes in several important points as the result of a regulation passed by the Ministry of Education on May 12, 1912.

The most important provisions are the following: The study of agriculture, together with all Agricultural Institutions, collections and other aids to scientific education, forms an integral part of the Faculty of Philosophy. Only those persons who are admitted to the Philosophical Faculty on the strength of possessing a matriculation certificate can become regular students. Others are admitted to separate courses of lectures only as unattached students. The complete course, which is necessary in order to obtain a final certificate and the diploma, lasts for four years.

The subjects are divided into obligatory and optional. Every regular student is required to attend the lectures on the former subjects according to the prescribed scheme.

Every regular student is required, at the close of each session, to take an examination for the purpose of showing the progress he has made in agricultural knowledge, the successful passing of this test being the condition of his admission to the next annual course. In order to obtain the leaving certificate and diploma, the student is required to pass a final examination at the close of his fourth year of studies. The examinations are *viva voce* and held in public. In order to gain the diploma, the candidate must write a paper embodying his own observations; the choice of the subject is left to him to select from those which are represented by the agricultural courses. In the diploma it is stated that the student, having completed his agricultural course and passed the examinations, is sufficiently, well, very well, or excellently equipped with the theoretical knowledge necessary for the agricultural profession. Regular students who can give proofs of a four years course of University study can also take the degree of Doctor of Philosophy according to the regulations customary in that faculty. The required doctorate thesis may deal with agricultural subjects, and in this case will form part of the work required from the student in his agricultural examination.

207 - The Colonial Agricultural College at Tunis.

L'Ecole coloniale d'Agriculture de Tunis. — *Bulletin agricole de l'Algérie et de la Tunisie*, Year XVIII, No. 20, pp. 469-478. Algiers, October 15, 1912.

The Colonial Agricultural College at Tunis was founded in 1898 Since then it has been attended by upwards of 300 students; of these

97 are engaged in farming in Tunis and 32 in Algeria ; 20 who have remained in the colony have taken up professions which are only indirectly connected with agriculture ; 103 have returned to France and are occupied in farming ; the others are in Morocco (7), in Indo China and Madagascar (17), in America, Egypt and Tripoli (8); lastly there are 16 in the military service and 9 have died.

The college farm disposes since last year, of a cultivable area of about 400 acres, of which 54 acres are under vines and 22 under olives. The property is provided, by means of underground wires, with electric power for the agricultural machines.

At present three experiment stations are connected with the college : for agriculture and agricultural botany, for the technique of farming and irrigation, and for agricultural parasitology. In order to keep the college in touch with the Central Station on the one hand and with the branch Stations and the farmers on the other, the director of the Central Station was appointed inspector of agriculture for the whole colony. In the year 1910-11, 688 cwt. of improved seed wheat which had proved the best for the region were distributed among 60 colonists and as many native farmers. Last year one half of the available area of the college farm was devoted to the production of the best seeds.

Numerous experiments have been conducted on various systems of farming, on the use of new implements for dry-farming, on methods of sowing, on application of manures, on the growing of several varieties of cotton, forage plants and vines, on the work of draught animals, on the use of windmills, on evaporation from the soil, irrigation, control of plant diseases and parasites, etc.

The curriculum is that of a college of agriculture. In the near future the successful passing of examinations at the end of a two-years course of instruction will confer the title of colonial agricultural engineer (Ingénieur colonial agricole).

The object of the foundation of this Institute was to give the future colonists of North Africa an opportunity of obtaining a thoroughly good agricultural education, both theoretical and practical, in the country itself in which they intended practising. For this reason the school receives, besides regular students, other pupils, the so-called "stagiaires agricoles." These are either intending colonists who have already gone through an agricultural college in France or who have already been engaged in practical farming in Europe and who wish to become acquainted, in the shortest time possible, with the special conditions of farming in a dry climate, before undertaking operations on their own account. The occasion to learn practically as volunteers on private estates but rarely occurs, as colonists accept only those young men whom they have previously known. On the property and experiment fields of the Institute the students can follow all the various operations and attend the lectures and practical exercices which interest them as well as the courses of Arabic.

By their intercourse with their fellow students, professors and colonists, they learn the habits and customs of the country; they can afterwards extend and complete their practical knowledge in any private farm and finally utilize it to advantage in their own farms.

AGRICULTURAL INSTITUTIONS

208 - The Swiss Dairy Association.

Der Schweizerische Milchwirtschaftliche Verein. — *Schweizerische Milchzeitung*, Year 38, No. 103, pp. 1-2; Year 39, No. 1, pp. 1-2. Schaffhausen, December 24, 1912, and January 3, 1913.

The Swiss Dairy Association has hitherto chiefly been employed in improving dairy technique and the instruction of persons engaged in this industry.

The increasing importance of the Swiss Dairy Association — at the present time about 220 million gallons of milk are technically treated — the present condition of trade, and the efforts of the peasants for organization, have induced the Association to aim at the following points in future:

1) The improvement of instruction in dairy subjects.
2) Improvement of quality.
3) Stricter organisation.

As the first step to attaining these ends, and as a result of the experience of farmers in the matter of the Peasants' Secretariat, it was resolved that a Dairy Secretariat should be formed. The duties of this Secretariat were defined as follows:

1) The support of the Dairy Trade in commercial and legal questions.
2) The extending of the markets.
3) The promotion of literature on dairy subjects.
4) The establishment of an information bureau and returns of prices.

The necessary funds are to be obtained from the contributions of the different branch associations and from the grants of the league.

209 - The Agricultural Associations of the Cape Province.

Landwirtschaftliches Vereinswesen der Kapprovinz. Bericht des landwirtschaftlichen Sachverständigen beim Kaiserlichen Generalkonsulat in Kapstadt. — *Nachrichten für Handel, Industrie und Landwirtschaft*, No. 139, p. 5. Berlin, December 3, 1912.

In Cape Province there have been hitherto four large Agricultural Central Associations: the Cape Province Agricultural Union, the Cape Province Central Farmers' Association, the Western Province Board of Horticulture and the Eastern Province Board of Horticulture. Only the first of these was affiliated to the South African Agricultural Union, which covers the whole territory of the Union of South Africa.

On the occasion of last year's joint congress of the Cape Province Agricultural Union and the Western Province Board of Horticulture in East London, the long projected union of the four central associations was accomplished. The new society was entitled: "The Agricultural Association of the Province of the Cape of Good Hoope." It includes all the various local agricultural associations of the Cape Province.

The new association will appoint a central committee in which the interests of the different classes of agriculturists willl be represented. Affiliation to the South African Agricultural Union is contemplated.

AGRICULTURAL SHOWS AND CONGRESSES

210 - Central Agricultural Shows in France in 1913 (1).

Concours Centraux agricoles en France en 1913. — *Journal Officiel de la République Française*, Year XLV, No. 18, p. 534. Paris, January 19, 1913.

By a decree of Jnuary 15, 1913, the Minister of Agriculture has decided that the Central Agricultural Shows in 1913 will be held in the following places:

Antibes	March 10-16
Montauban	May 5-12
Epinal	May 19-25
Tarbes	May 26-June 1.
Nantes	May 26-June 1.
Chateauroux	June 2-8
Gap	June 2-8
Evreux	June 9-15

The programmes can be obtained from the Ministry of Agriculture and at the prefectures of the Departments concerned.

211 - General Show of Breeding Animals in Paris in June 1913 (2).

Concours général d'animaux reproducteurs à Paris, en juin 1913. — *Journal officiel de la République Française*, Year XLV, No. 18, p. 535. Paris, January 19, 1913.

By a decree of January 15, 1913, the Minister of Agriculture has decided that a general show of breeding cattle, sheep, pigs and sheep-dogs will be held in Paris on the Champs de Mars from Tuesday, June 17, to Sunday, June 22, 1913. The names of intending exhibitors must be sent in to the Ministry of Agriculture before May 5 at the latest. Forms for the use of exhibitors will be obtainable from the Ministry of Agriculture and from the Prefectures from March 15.

212 - Competitions organized by the Central Agricultural Association of Hérault, France, at Montpellier.

Concours organisés par la Société Centrale d'agriculture de l'Hérault. France. — *Bulletin de la Société des Viticulteurs de France, et d'Ampélographie*, Year XXV, No. 2, pp. 28-29. Paris, February 1913.

The Central Agricultural Society of Hérault is organizing, with a subvention of 5000 francs (about £200) from the Minister of Agriculture, the following competitions which will be held, the first four on April 26, 1913 and the last during the month of November.

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(1) See No. 100, *B.* Feb. 1913. (*Ed.*).

(2) See No. 1602, *B.* Dec. 1912. (*Ed.*).

I. Competition of sprayers.
  A. Large sprayers, mounted on wheels and for pack mules.
  B. Knapsack sprayers:
    a) with pump
    b) with preliminary compression.
II. Competition of sulphurers and dusters.
  a) Large sulphurers and dusters.
  b) Knapsack and hand sulphurers and dusters.

III. Competition of large ploughing implements: two-share and three-share ploughs, etc.; hoes, scarifiers, harrows and surface pulverisers. These implements must work one or several rows of vines at a time. They may be harnessed to several horses.

IV. Competition of powders containing copper for the protection of vines against mildew.

V. A competition of vineyard ploughmen will be held in November.

For particulars apply to the " Société centrale d'agriculture de l'Hérault," 17 Rue Maguelonne, Montpellier.

213 - Exhibition of Machines with Combustion Motors for tilling the Soil, at Galanta, Hungary, August 1913.

SPORZON, PAL JUN. Az 1913, évben rendezendö motoros szántó-és talajmivelögépek bemutatásának tervezete. — *Köztelek*, Year XXIII, No. 6, p. 169. Budapest, January 22, 1913.

The Hungarian Agricultural Association is organizing, with the financial assistance of the Royal Ministry of Agriculture, the Exhibition, mentioned in the title, which will be held in August 1913, together with experiments. Entries must be made not later than March 31, 1913.

The object of this exhibition is to present home and foreign machines that have been tested and to discuss them systematically. The provisions adopted by the Committee are essentially the following:

The prescribed depth of the furrows will be 7 to 8¼ inches. Exceptions will be allowed. The exhibitor may provide his own fuel, but this must be handed over to the Committee for examination before being used. The Committee provides fuel on request. For the experiments to be made with each machine an area of at least 7.41 acres is provided.

Prof. Pál Sporzon, Director of the Machine Experiment Station at the Royal Hungarian Academy of Agriculture in Budapest has been charged by the Committee with the drawing up of the programme.

214 - General Agricultural Show at Tunis from April 18 to 27, 1913.

Concours général agricole à Tunis, du 18 au 27 avril 1913. — *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 5, p. 79. Algiers, January 30, 1913.

This Show, during which motor-culture trials will be held, will take place at the same date as the Congress for the Advancement of Science.

215 – Agricultural Show at Palestro, Dra-el-Mizan, Algeria, from May 22 to 25, 1913.

Concours agricole à Palestro, Dra-el-Mizan, Algérie du 22 au 23 mai 1913. — *Office du Gouvernement général de l'Algérie*, Year XIX, No. 4, p. 6. Paris, February 15, 1913.

216 – Agricultural Show and International Exhibition of Automobiles and of Industrial and Agricultural Motors to be held at Algiers in March-April 1913.

Concours agricole et exposition internationale d'automobiles et de moteurs industriels et agricoles à Alger, en Mars-Avril 1913. — *Office du Gouvernement général de l'Algérie*, Year XIX, No. 4, p. 6. Paris, February 15, 1913.

On the 22nd of March an exhibition organised by the Automobile Club will be opened at Algiers. The exhibition will include amongst other objects: agricultural motors and implements; chemical products used in agriculture and manures; there will also be a show of breeding animals (April 16 to 20) a horse show; a cold storage exhibition; a horticultural exhibition; as well as a mechanical ploughing competition.

For information, apply to the Secretary of the Automobile Club d'Algérie: 23 Boulevard Carnot, Algiers.

217 – Spanish-American Exhibition at Seville, Spain, from January 1 to October 31, 1916.

Gaceta de Madrid, Year CCLI, Vol. IV, p. 880. Madrid, December 21, 1912.

A Royal Decree, dated December 20, 1912 postpones to January 1-October 31, 1916, the Spanish-American Exhibition which was to have been held in 1914.

218 – Exhibitions and Congresses of Agriculture in London in June 1914.

Tropical Life, Vol. IX, No. 1, p. 2. London, January 1913.

In June 1914 the following will be held in London: 1. The First International Exhibition of cotton, fibres, principal tropical produce and kindred matters. 2. The Fourth International Rubber Exhibition. 3. The International Congress of Tropical Agriculturists.

The first exhibition will include a section for palms and their products: fruits, kernels, oil, fibres, sugar, alcohol, etc., from coconut, oil palm (*Elaeis guineensis*), wild date (*Phoenix sylvestris*), palmyra (*Borassus Nipa*), nipa (*Nipa fruticans*), kittool (*Caryota urens*), buri (*Corypha data*), sugar palm (*Arenga* [*Sagerus*] *saccharifera*), sago palm (*Metroxylon Rumphii*), etc.

219 – International Rubber Congress from September 7 to 12, 1914, and International Rubber Exhibition from September 8 to October 10, 1914, at Batavia, Java.

Het Int. Rubber congress en Rubbertentoonstelling, Batavia 1914. — *Tijdschrift voor Nijverheid en Landbouw in Nederlandsch Indie: Uitgegeven voor de Nederlandsch-Indische Maatschappij van Nijverheid en Landbouw*, Vol. LXXXV, No. 6, pp. 371-377. Batavia, December 1911.

The exhibition will include the following sections: Botany, cultivation, collection, preparation and packing, parasites and other pests and means of control, economics (dwelling houses, hygiene, public worship and education), wild rubber and kindred substances, rubber substitutes, guttapercha and balata, commerce and statistics, literature, vulcanized rubber, methods of scientific investigation. — The Congress will include the following sections: botany and zoology, climate and soil, cultivation and harvesting, preparation, economy of production, synthetic rubber, commerce.

220 - Universal Exposition at San Francisco, by Authority of the United States Government, 1915, February 20 to December 4. Celebrating the Opening of the Panama Canal.

In order to celebrate the opening of the Panama Canal, which will be officially inaugurated on January 1, 1915, the Federal Government of the United States announces a Universal Exhibition which will be held at San Francisco, California, from February 20 to December 4, 1915. The Exhibition will include the following sections: fine arts, education, social economy, liberal arts, various manufactures and industries, machinery, means of transport, agriculture, animal husbandry, horticulture, mining and metallurgy.

221 - Horticultural Congress in Paris, May 22, 1913.

Congrès d'Horticulture de 1913 à Paris, le 22 mai. — *Journal de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, pp. CVIII-CIX. Paris, December 1912.

The twenty-sixth congress organized by the National Horticultural Society of France will be held in Paris on Saturday, May 22, 1913, in the large hall of the Society, 84 Rue de Grenelle. All details May be obtained from the Office of the Society.

222 - The Sixth International Congress of the Dairy Industry, at Berne, Switzerland, in 1914.

VI^e Congrès International de l'Industrie Laitière à Berne, Suisse, en 1914. — *La Terre Vaudoise*, Year 5, No. 4, p. 42. Lausanne, January 25, 1913.

The Universal Association of the Dairy Industry has entrusted the Congress of 1914 to Switzerland. The bureau of the Congress is established provisionally at the Liebefeld in Berne.

223 - International Dry-Farming Congress and Soil Products Exposition at Tulsa, Oklahoma, U. S. A., from October 22 to November 1, 1913.

CROPS AND CULTIVATION.

224 - A Method of Approximating Rainfall over Long Periods and Some Results of its Application.

AGRICULTURAL METEOROLOGY

DOUGLASS, A. E. Abstract from *Astronomical and Astrophysical Society of America.* — *Science*, New Series, Vol. XXXVII, No. 940, p. 33. Jan. 3, 1913.

It was found by a test extending over 43 years that the radial thickness of the rings of the yellow pine of northern Arizona gives a measure of the rainfall in that region with an average accuracy of over 70 per cent. By applying a simple formula, taking into account the conservation of moisture, the accuracy may be increased to about 75 per cent. By cross identification of rings between all the hundred trees examined, the accuracy of counting rings was greatly increased.

Five trees from the vicinity of Flagstaff Observatory were measured to the number of 400 rings, and two of these to 500. It was found that all the trees in that locality gave very similar records. A 21 year variation amounting to 16 per cent. of the mean is shown in 400 out of the 500 years recorded. A shorter variation amounting to 16 per cent. of the mean was found to have a period of 11.4 years. Its plot derived from 492 years shows two maxima which correspond in time with two maxima of rainfall in the 50 years of records on the southern California coast. These in turn match the major and minor maxima in the temperature of that region for the same period. The larger maximum of the latter occurs at the time of the sun-spot minimum as averaged for 125 years.

225 - Convenient Conversion Table for Frost Work.

MC ADIE, A. G. in *Monthly Weather Review*, Part I, Climatology, Climatological Summary for District 11; Vol. 40, No. 6, pp. 938-939. Washington, June 1912.

Orchard heaters, evaporators, and frost protectors of various forms have come into such widespread use that a convenient table for the quick conversion of heat units into power units, and vice versa, seems to be much needed.

It may be pointed out that the British thermal unit is the quantity of heat required to raise the temperature of 1 pound of pure water at maximum density (39.1° F.) 1° F. This is the unit most frequently used by engineers in the United States and Great Britain, although it is deemed desirable that the old English units and the Fahrenheit scale be used as little as possible, A British thermal unit is equal to 0.252 calorie and also equal to 777.5 foot-pounds, One therm will raise the temperature of 1 gram of water 1° C.; 1 000 therms equal 1 calorie, equal to 3.968 British thermal units.

In problems connected with the heat of water, it should be remembered that the total heat is the latent heat plus the sensible heat. The total heat required to evaporate water at a given temperature is 1 059.7+

0,428 T, where T is given temperature. This holds for temperatures between 32° F. and 212° F., or 0°C. and 100° C.

In changing to steam at 212° F. a pound of water at 212° F. absorbs 970.4 British thermal units and the total heat is therefore 1 150.4 British thermal units. This is starting from a temperature of 32° F. A pound of ice at 32° requires 142.4 British thermal units to change into water at 32° F. The latent heat of aqueous vapour mey be found from the following formula:

$$L_d = 1\,091.7 - 0.572\ t_d$$

Where L_d = latent heat, and t_d = temperature of water.

For convenience in frost work the following may be used:

1 kilowatt hour = 3 412.66 B. t. u.
1 H.P. = 746.3 watts.
1 H.P. hour = 2 544.6 B.t.u.
1 B.t.u. = 777.5 foot-pounds.
1 B.t.u. = 0.252 calories.
1 calorie = 1 000 therms.
1 calorie = 3.968 B.t.u.
1 calorie per kilogram = 1.8 B.t.u. per pound.
1 pound of air at 32° F. occupies about 12.4 cubic feet.
1 pound of water at 212° F. occupies 0.0161 cubic feet.
1 pound of steam at 212° F. occupies 26.14 cubic feet.
1 pound of water at 212° F. contains 181.8 B.t u.
1 pound of steam at 212° F. contains 1 150.4 B.t.u,
1 pound of ice requires 143.8 B.t.u. to change to water.
1 cubic foot of water at 212° F. weighs 59.84 pounds.
1 cubic foot of water at 62° F. weighs 62.2786 pounds.
1 cubic foot of steam at 212° F. weighs 0.03826 pound.
1 cubic foot of dry air at 32° F. weighs 568 grains.
1 cubic meter of dry air at 0° C. weighs 1 293.05 grams.
Specific heat of water, 1.000.
Specific heat of ice, 0.489.
Specific heat of water vapour, 0.453 at atmospheric temperatures.
Specific heat af air, 0.241.

Values given above are laboratory values, obtained by using distilled water. Ordinary drinking water is heavier than distilled water, because of matter in solution. Salt water is also heavier. It may also be remarked that the temperature of the freezing point in ordinary use, *i. e.*, 32° F., or 0° C., may not hold for the freezing of water in plant life. W.N. Shaw instances one plant in which the freezing point is apparently 21° F., or-5° C. In other words, the change of water from the liquid to the solid state under natural conditions is somewhat different from the change as studied in a laboratory.

Some of the values given above differ slightly from those found in textbooks, but it is believed they are the most recent.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

226 - Agricultural Study on Manganese.

1. NOTTIN, P. Etude agrologique du manganese. — *Comptes Rendus de l'Académie des Sciences*, Vol. 155, No. 23, pp. 1167-1169. Paris, December 2, 1912.
2. ID. in *Annales de la Science Agronomique*, Year 30, No. 1, pp. 1-12. Paris, January 1913.

The writer proposes to study manganese systematically from an agricultural point of view, and to ascertain what becomes of the manganese introduced into the soil under the form of manganous salts.

Absorbent power of the soil. — By using the method adopted for ammoniacal sals, the absorbent power of the soil towards the salts of manganese is easily demonstrated.

	Saline oxide of Manganese fixed by 50 grams of soil
Garden soil containing 85 % of lime	0.161 — 0.163 gram
» » » 19 » » »	0.153 — 0.159
Fallow soil » 5 » » »	0.097 — 0.103

The various elements constituting the soil have not the same influence on this absorbent power:

1. *Silicious sand* has no action.
2. *Limestone* is strongly attacked in the cold by solutions of manganese sulphate or chloride; the whole of the acid remains in solution and the dissolved calcium replaces the manganese rendered insoluble, in the proportion of the atomic weights. In fact the ratio $\frac{\text{Precipitated manganese}}{\text{Dissolved calcium}}$ has been found to be 1.37; theoretically 1. 375.
3. *Humus* does not play any part in the fixing of manganese. Peat and natural mould may, it is true, precipitate it owing to the calcium compounds they contain, but when these substances are freed from lime by means of an acid, they show no power of fixing.
4. *Natural clay*, taken in the form of loam, has sharply reacted on the solution of manganese sulphate, giving the figure 5.04 for the ratio $\frac{\text{Precipitated manganese}}{\text{Dissolved calcium}}$. Clay has thus an action of its own independent of the presence of lime.

As the soil possesses the power of fixing manganous salts, only small quantities of this element are to be found dissolved in the water of the soil. In fact the washing of 2 kilos of soil by 9 litres of water gave 17 milligrams of saline oxide of manganese, or 8.5 mg. of soluble saline manganese oxide per kilo. This soil nevertheless contained 1.45 grams of soluble saline oxide per kilo. Slightly aciduladed water dissolves a little more manganese: 0.037 to 0.088 grams of saline manganese oxide per kilo, according to the soils.

Consequently the drainage water contains also feeble proportions of manganese: 0.25 to 0.5 milligrams of saline oxide of manganese per litre. It is not enriched by the addition of sulphate of manganese to the soil. In fact the writer collected during a year the drainage water from two cylinders, both of them watered in the same way and each containing 10 kilos of the same soil; one of the two had received 0.5 gram of sulphate of manganese by means of superficial watering; the other had not received any addition. Only the sulphuric acid passed into the drainage water without the corresponding manganese.

Summing up, arable soil renders manganese insoluble and retains it in the same way as it absorbs ammonia, potash and phosphoric acid.

Solution of the natural manganese of the soil in various reagents. — In regard to concentrated acids the figures obtained are so large in comparison with the quantities of manures usually employed that they do not present much interest from an agricultural point of view. On the contrary, the writer has found in the soils he examined such quantities of manganese soluble in acidulated water (1) as were sufficient to allow of an easy determination. It would be desirable, however, to know if the content of a soil in manganese soluble in acidulated water is connected with the requirements of this soil as to manganese manure. In order to solve this question a determination of the manganese soluble in weak reagents: water, acidulated water and ammonia, should be made in all those cultural experiments which are carried out on manganese manures.

227 – The Black Soils of the Oued R' Dom Valley in Marocco

GIN, G. Les terres noires de la vallée de l'Oued R' Dom au Maroc. — *Comptes Renaus ae l'Académie des Sciences de Paris*, Vol. 155, No. 23, pp. 1166-1167. Paris, December 2, 1912.

Three samples of arable soil taken from the very fertile valley of the Oued R' Dom in the neighbourhood of Dar Caïd Ben Ali in Morocco have been investigated by the writer and M. Mallet; they have the following composition (per thousand):

	I	II	III
Silica	296.3	318.2	464.1
Alumina	636.3	609.4	562.5
Oxide of iron	3.8	4.2	4.3
Phosphoric acid	1.2	1.4	1.3
Carbonic acid	5.4	5.8	5.8
Lime	5.8	6.1	6.3
Magnesia	2.0	3.1	3.0
Potash	4.1	4.7	4.3
Organic matter	24.6	26.6	30.1
Loss at 110°C	8.2	7.9	7.4
Combined water	10.2	9.2	8.4
	998.8	996.6	997.5
Organic nitrogen	1.52	1.72	1.64

The saturation capacity of these soils is 51.2 per cent. and their retention capacity is 34.3 per cent. Thus, one cubic foot can hold about

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(1) 5 cubic centimetres of nitric acid per litre, after cessation of effervescence. *Comité consultatif des Stations agronomiques et des laboratoires agricoles. Methodes d'analyse des terres. Paris*, 1898. (*Ed.*).

2.14 gallons of water of imbibition and 1.25 gallons of water of combination, *i. e.* a total of 3.4 gallons.

Although the soil appears completely dry in summer, yet plants continue to grow in it during the hot months, so that the black soils lend themselves to dry-farming; in explanation of this the writer suggests that the plants must possess the power of absorbing the water of combination from trihydrated alumina, $Al_2 O_3, 3H_2O$, which remains in the clay after the disappearance of the water of imbibition.

The characteristic black colour of the soils of the Oued R' Dom, and in general of the Tirs of Morocco, is due to an amorphous humic substance resulting from the decomposition of vegetable matter, which has been transformed by gradual oxidation. It is partially soluble in caustic potash, giving a brown liquid.

The formation of the black matter is analogous to the process which results in peat and is promoted by the alternated wet and dry condition of the soil, the latter facilitating free access of air by the production of cracks.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

228 - **Irrigation Investigations at the Utah Experimental Station.**

WIDTSOE, J. A., STEWART, R. and MERRILL, L. A. *Bulletin of the Utah Experimental Station*, Nos. 116, 117, 118, 119, 120, pp. 1-240. Logan, Utah, September 1912.

During the period 1902-1911 a large number of crops were grown on the Greenville experimental plots with various amounts of irrigation water, in order to investigate the influence of the water supply on the yields obtained. The average results for five of the chief crops are as follows:

Yield in lbs. per acre.

Crop	Irrigation water in inches								
	5	7½	10	15	25	30	35	50	55
Wheat.	4 969	5 545	5 684	6 279	6 672	—	7 229	7 999	—
Maize	—	10 757	12 762	13 092	13 856	14 606	—	—	12 637
Alfalfa	—	9 094	6 942	8 369	8 606	8 133	—	9 949	—
Beetroot	—	6 080	8 053	8 630	10 076	10 271	—	11 528	—
Potatoes	2 310	2 730	2 925	3 405	4 005	3 660	—	3 795	—

The yields increase with the amount of irrigation water applied, but with each additional increase in the irrigation water, the corresponding increase in yield diminishes, till a point is reached where further applications merely reduce the yields. This point is above 50 in. for wheat,

alfalfa, beet and potatoes, but lies between 35 and 55 in. for maize. Further, when certain crops were grown without any irrigation at all they produced from 67 per cent. for potatoes to 85 per cent. for wheat of the yield obtained when 7 ½ in. of water were applied. As the total amount of irrigation water in any district is usually limited, the question of utilizing it to best advantage is of great importance and the above figures would indicate that far larger yields of produce could be obtained by spreading a given amount of water over a large area than by concentrating it on a smaller one.

Other experiments for investigating the number of irrigations and the time of year at which they should be applied showed that in a general way the best results were obtained when the applications of water were distributed so that the soil remained approximately equally moist throughout the growing season; with wheat and maize, the supply of moisture was specially important during the period of seed formation, *i. e.* at the period of transference of food material from the straw to the grain; with beet and potatoes, July and August were the two important months, and later applications did not appear to produce any material increase; with alfalfa the total yield was little affected whether the water was applied just before or just after each cutting. On the Greenville farm, where the annual rainfall is over 15 in., and where the soil is saturated at the time of planting, no advantage was obtained by irrigating before seed time; but applications of spring flood water (which would otherwise run to waste) after seed time but before the usual irrigation season gave some slight increase in yield, this increase being greater the later in the season the application could be delayed. Two methods of application were tried— flooding and furrowing — and the results suggest that cultivated crops do equally well with either of the methods, while non-cultivated crops are better when flooded.

In a certain number of the trials the crops were sampled, just before each irrigation, and subjected to analyses in order to ascertain the proportion of leaves, stalks, etc., in the plants, and the chemical composition of the different parts. The following conclusions were reached.

The plants grown with much water tend to be more leafy and, in the case of cereals, to have relatively lighter heads — the percentage of grain in the wheat crop varying from 33 per cent. where 50 in. of water was used to 44 per cent. with only 5 in.; these differences become evident early in the season.

The percentage of *water* in the parts of the plant above ground decreases with the amount of water applied, while in the underground parts (tubers of potatoes and roots of beets) it tends to remain constant.

The *ash* content on the other hand increases with the irrigation water in the aerial parts of the plant, and varies inversely with the irrigation water in the subterranean parts of the plant.

The *protein* content varies inversely with the irrigation water in all parts of the plant.

In sugar beets and potatoes the percentage of *carbohydrates* (starch + sugars) increases with the irrigation water.

Lastly, the protein content was also estimated in the wheat crops where the distribution of equal amounts of irrigation water was varied, and the results show that when the greater part of the water is applied early in the season the percentage of protein is highest, and the more irregular the applications the higher this value appears to be.

229 - Experiments with Butz' Drains in the Peat Moor near Bernau on the Chiem See.

HARTTUNG, M. Versuche mit Butz'scher Drainage (1) im Hochmoore bei Bernau am Chiemsee. — *Der Kulturtechniker*, Year XVI, No. 1, pp. 51-53. Breslau, January 1, 1913.

For the drainage of the Lake Chiem moor, Butz' new drainage process was used.

Herr Butz selected as field of his operations an area of peat moor which the Bavarian Institute of Moor Culture is cultivating at present. The depth of the peat bed reaches 18 feet. In the year 1911 about 13.8 acres of this moor were drained by means of narrow ditches about 3 feet average depth. These ditches were deepened in 1912. In spite of this only gradual deepening of the ditches their sides showed a strong tendency to cave in. It became necessary to open each ditch to the necessary depth and to put in immediately the drain and to cover it partially. Under these unfortunate conditions a somewhat higher amount of labour was employed for the drainage than that stated by Herr Butz. From the tables which accompany the text it appears that to the rather high cost of this moor draining the constitution of the moor as to water content and to the presence of wood, roots, etc., as well as the depth of the drains, contributed more than the system employed.

TILLAGE AND METHODS OF CULTIVATION

230 - Use of Dynamite for breaking up Land (2). Experiments conducted at the Agricultural Station of Lausanne (Switzerland).

DUSSERRE, C. La culture du sol à la dynamite. — *Procès-Verbaux de la Société Vaudoise des Sciences Naturelles*, No. 3, 1913. (Séance du 22 Janvier). Lausanne, January 1913.

In order to bring under cultivation virgin soils which are not easily attacked by the plough, American farmers sometimes use dynamite. They make blast-holes 13 to 23 feet apart and 30 to 40 inches deep, at the bottom of which they place dynamite cartridges containing 15 to 20 per cent. of nitroglycerine and weighing 5 to 8 $^3/_4$ ounces ; the holes are then filled with sand or clay, and well rammed. Each cartridge is provided with a fulminate cap and a match, an extremity of which protrudes a few inches above the soil. The cartridges are fired either by lighting the matches direct or by electricity. The explosion raises the ground, and breaks it up sufficiently to allow it to be easily ploughed. The cost of the operation is reckoned at £2 8s to £4 per acre.

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(1) Butz' system consists in the use of long wooden drains, having a square cross section, made of boards 0.4 to 0.8 inch thick, 2 to 8 in. broad and usually 13 feet long, nailed together and forming one long drain. *(Ed.)*

(2) See : CORNELIO GUERCI, Esperimenti nel dissodamento del terreno col mezzo della dinamite. — *Annali della R. Accademia di Agricoltura di Torino*, Vol. XIII, p. 37. Turin, 1880. — See also No. 2529, *B.* Aug.-Sept.-Oct., 1911 ; No. 3135, *B.* Nov.-Dec. 1911 ; No. 671, *B.* April 1912; No. 777, *B.* May 1912; No. 1398, *B.* Oct. 1912. *(Ed.)*

In order to form an opinion on the utility of this process, new to Switzerland, the Federal Institution of Agricultural Chemistry at Lausanne made, in November 1912, some experiments in the property of Colonel Ribordy at Planisse sur Saint Léonard (Valais). Some land intended for a plantation of fruit-trees was prepared by exploding at the spot to be occupied by each tree a cartridge of about 8 ³/₄ oz. of " gamsite " a safety explosive manufactured by the Gamsen (Valais) works, and containing about 24 per cent. of nitro-glycerine. This operation prepares the ground very well for planting young trees. The explosion of the charge placed at a depth of 40 inches, raises and breaks up a volume of from 35 to 52 cubic feet of earth in the form of an inverted cone, the base of which measures on the surface of the soil about 6 ft. 6 in. The grassy sods were projected to a short distance. In spring all that will be required before planting will be to shovel out a hole large enough to accomodate the roots so that they may develop freely without encountering resistance. The whole operation costs about *7d* per tree, while the holes for planting made by hand labour often cost more and their volume does not exceed 17 cub. feet. Experience has proved that trees planted in soil prepared by dynamite developed more rapidly and came into bearing earlier than those planted in the usual manner.

It appears also that dynamite might be advantageously used for preparing land for plants possessing deep roots, such as the vine, especially when the subsoil is hard and compact. With holes at 16 ½ ft. apart and cartridges containing 5 oz. to 8 ³/₄ oz. of explosive (which seems sufficient), the cost of breaking up the land does not exceed £8 per acre, while the same work done by hand to a depth of 2 feet costs about four times as much.

Among other experiments one was made in a moist soil on which it was intended, after drainage, to grow lucerne. The resistance of the water did not allow of useful work being done ; the energy of the explosive was spent in projecting the soil to a great height, making holes measuring about 17 cub. ft. This method does not therefore seem advisable for soils possessing a water table not far from the surface.

By using the so-called safety explosives (cheddite, gamsite, westphalite, telsite, etc.) prepared by various factories, the soil can be worked without incurring any serious danger, provided of course that elementary precautions be taken to guard against accidents.

MANURES AND MANURING

231 – The Composition of Russian and Foreign Fish Manures and of other Manures of Marine Origin.

KOSSOWITSCH, P. S. and KOROLOW, G. I. K voprosu o sostavie russkich o inostrannych rybnych tukov i drughich udobrenij «mosrkago» proiskhoydenia. — *Jurnal Opetnoi Agronomii* (Russisches Journal für experimentelle Landwirtschaft), Year XIII, Part 6, pp. 801-814 (815-816). St. Petersburg, 1912.

This article gives useful information regarding the composition of Russian herring manure, comparing it with different fish manures and similar manures from other countries. For the latter purpose, the results of numerous analyses of the most various manures of "marine" origin have been collected, many of the data having been taken from the agricultural press.

The following table gives the composition of three kinds of Russian herring guano, which were analysed at the St. Petersburg Agricultural Laboratory of the Chief Office of the Land and Agricultural Organisation Society.

At the end of the summary, the writers come to the following conclusions. All fish manures can be divided into two groups; the first includes those which are relatively poor in phosphoric acid (not more than 7 per cent), while those of the second group have a high phosphoric acid content (12 to 15 per cent.). The Russian herring manures examined in the abovementioned laboratory belong to the first class. A third class is formed by manures made of lower marine organisms, and characterised by a low percentage of phosphoric acid (0.6 to 1.6; in the case of *Fucus* only 0.1 per cent.). These various manures contain very different amounts of nitrogen. In the first class, the nitrogen content varies from 6 to 13 per cent.; the second lot are more even, ranging from 6 to 9 per cent.; the representatives of the third class have from 1.4 to 5.3 per cent. of nitrogen and the *Fucus* seaweed only 0.35. All the manures mentioned, except the American fish-guano, are extraordinarily deficient in potash, averaging only about 1 per cent. Data respecting the fat content are only available in the case of the first and third classes; in the former, this varies from 4 per cent. to 18 per cent.; Russian herring guanos from Sakhalin are almost the poorest in fat, while the Vladivostok guanos occupy a middle position from this point of view. The fat content in the third group varies from 0.7 per cent. to 5 per cent.

The Composition of Russian Herring Manures.

	In 100 parts of dried substance:													
								Extracted from the ash by 10 % HCl						
	Hygroscopic water	Loss on ignition	Ash	Total nitrogen	Total phosphorus	Total fat	Ash insoluble in HCl	Silica	Clay	Oxide of iron	Lime	Magnesia	Potash	Soda
Manure from Sakhalin: I . .	9.796	81.656	18.344	10.280	6.748	5.808	1.816	0.129	—	—	6.208	0.551	1.029	1.530
Manure from Sakhalin: II . .	10.630	88.336	11.664	10.918	4.268	6.240	1.064	0.211	—	—	2.915	0.430	1.032	1.498
Manure from Vladivostock .	6.660	86.800	13.200	11.770	4.850(1)	11.612	—	—	0.12 (1)	0.13 (1)	4.46 (2)	0.33 (1)	0.84 (1)	0.63 (2)

(1) Extracted with sulphuric acid + nitric acid.
(2) Extracted from the ash by nitric acid.

232 - Agricultural Value of Carbonate of Lime recovered from Causticising Plant.

HENDRICK, K. J. in *British Association for the Advancement of Science.* Dundee 1912. Section M. (Agriculture) *m* 17. London.

The writer states that great quantities of precipitated carbonate of lime are obtained as a by-product from causticising plant, and that in many parts this precipitated chalk is thrown on the dump-heap as a waste-product, while it may be that the surrounding fields are hungering for carbonate of lime.

This waste product as obtained from the dump-heap contains about 50 per cent. of moisture, and is a somewhat tenaceous substance. The dry matter is mainly carbonate of lime; small quantities of other substances are present, which vary considerably according to the process used. A little silicate of lime is always present, and there is generally some organic matter. The material is always alkaline; the alkalinity is in some cases due to calcium hydrate, and in others to sodium hydrate and carbonate; it varies greatly; in certain samples an alkalinity due to soda, and corresponding to 6 per cent. of sodium hydrate was found, in other samples the alkalinity was under 1 per cent.

Till now little use has been made of this substance; one reason for this is that in the wet state it is difficult to spread; it is however easily dried, when it forms a fine powder, which is easily distributed.

A number of field experiments have been carried out with this carbonate of lime, in which it has been compared with other forms of lime, such as burnt lime and ground limestone. The experiments have all been made on land deficient in lime and very subject to finger-and-toe in turnips. So for as they have gone they show that whether the results are measured by increase of crop or by diminution of finger-and-toe disease, the precipitated carbonate of lime does at least as well as any other form of lime. It has, on the whole, acted better than an equal quantity of commercial ground limestone, as it is very much finer, and is therefore more thoroughly mixed with the soil. It was found that the presence of a small percentage of sodium hydrate and carbonate had no prejudicial effect on its action.

233 - The Secondary Effects of Phonolite.

KASERER, H. Ueber Nebenwirkungen des Phonoliths. — Aus dem Institut für landw. Pflanzenproduktionslehre und der Versuchswirtschaft der k. k. Hochschule für Bodenkultur in Wien. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien,* Vol. I, Part 3, pp. 271-284. Vienna, January 15, 1913.

One of the questions raised about the manurial value of phonolite is that of the eventual secondary effects on the utilization of the nitrogen in the soil, several opinions being current. The writer proposed studying the effect of phonolite on the utilisation of the nitrogen of the soil and of nitrogen in loams and sandy soils.

Arrangement and results of pot experiments.

Manure	Pots nos.	Barley								Forage maize			
		Number of		Crop in grams		Grain p. cent.		Straw p. cent.		Number of plants	Crop, grams	Dry Matter per cent.	Nitrogen per cent.
		Plants	Stems	Grain	Straw	Dry Matter	Nitrogen	Dry Matter	Nitrogen				
		Sandy soils.											
PN	17,24,31	18	89	52.5	106.2	89.96	2.656	91.08	1.542	29	122.5	90.30	0.920
PNK . . .	18,25,32	18	96	55.9	114.4	89.44	2.637	91.80	1.409	30	111.8	91.92	0.990
PNφ . . .	19,26,33	18	78	48.4	101.2	89.28	2.639	91.72	1.636	30	102.6	92.12	0.907
PNKφ . .	20,27,34	18	82	47.9	100.4	89.58	2.510	92.36	1.532	30	108.2	92.14	0.898
PK	21,28,35	18	63	61.0	77.0	89.28	2.063	91.94	0.725	30	82.9	90.76	0.994
Pφ	22,29,36	18	59	55.3	74.9	89.22	2.048	92.00	0.822	29	87.0	91.86	0.975
PKφ . . .	23,30,37	18	70	63.7	81.3	89.34	2.031	91.72	0.672	30	86.3	91.24	0.954
		Loamy soils.											
—	38,47,56,65	24	75	58.9	87.5	89.52	1.883	92.40	0.457	37	59.4	90.70	0.884
P	39,48,47,66	24	69	62.6	84.0	89.56	1.815	92.24	9.443	38	49.5	91.12	0.983
PN	40,49,58,67	24	144	109.3	150.8	89.62	2.075	94.36	0.747	39	75.8	91.34	0.847
PNK . . .	41,50,59,68	24	145	117.8	164.7	89.44	1.999	91.98	0.716	37	69.9	91.06	0.881
PNφ . . .	42,51,60,69	24	139	91.5	154.8	89.86	2.201	92.04	1.129	39	76.6	91.56	0.896
PNKφ . .	43,52,61,70	24	140	116.9	164.2	89.38	2.024	93.72	0.665	39	61.1	91.60	0.895
PK	44,53,62,71	24	78	70.4	89.1	89.46	1.786	91.92	0.425	40	45.5	91.46	0.971
Pφ	45,54,63,72	24	82	61.2	94.2	89.34	1.834	91.14	0.440	38	51.3	91.20	0.950
PKφ . . .	46,55,64,73	24	76	65.1	87.9	89.64	1.753	94.62	0.469	38	48.5	91.50	0.940

In each pot 9 500 grams of soil were placed, the same weight being used for the sandy and the loamy soils. The former contained 8.42 per cent. of moisture, the latter 17.98 and was besides very rich in phosphoric acid.

P represents 0.5 gram of phosphorus pentoxide as monocalcium phosphate ; N = 0.6 gr. of nitrogen as calcium nitrate ; K = 1 gr. of potash as potassium chloride ; φ = 10.8 gr. of phonolite containing 9.28 per cent. of potash.

The results given in the annexed table do not seem to show that the application of phonolite exerted any useful action, save by the direct action of the potash, and in the case of the very poor sandy soil not manured with nitrate, but not in the sense of favouring the fixation of nitrogen ; in all the other cases, as a secondary effect, a diminution of yield was observed. In the case of simultaneous application of phonolite and nitrate of lime, the lower yield was accompanied by a lesser utilization of the nitric nitrogen : hence the opinion that phonolite acts as a denitrifying agent.

Summing up, it appears that there is no evidence that phonolite has a favourable secondary action ; the contrary rather seems to be the case. Consequently, apart from its value as a potash manure, it should never be employed excepting where its favourable secondary effects have been ascertained by means of careful experiments. Lastly, it is to be noted that these results disagree with those obtained by Prof. Hiltner, but agree with those of Prof. Pfeiffer and his collaborators.

234 - New Experiments on the Fertilizing Property of Sulphur.

SABASCHNIKOFF, V. V. Novje Opjtj s Piernjm ziretom, kak oudsbrenjem. — *Jurnal Opatnoj Agronomtj* (Russisches Journal für experimentelle Landwirtschaft), Year XIII, Part 6, pp. 817-821 (821-822) + 1 plate. St. Petersburg, 1912.

The writer has made experiments (1) to ascertain whether flowers of sulphur have any effect on the growth of barley and rye. The experiments were carried out in the experiment garden of the Agricultural Institute at Nancy in a very rich clay soil after beets.

The soil analyses gave an average sulphuric acid content of 0.082 per cent. It is well known that most soils are poor in sulphuric acid, the amount varying, according to Hart and Petersen, from 0.033 per cent to 0.14 per cent., almost always remaining below 0.10 per cent. The sulphuric acid present in the experimental soil was thus an average amount.

The sulphur was applied before sowing (at about 1/3 oz. per sq. yd., or 90 lbs. per acre). The sowing was done on February 25, 1912.

The favourable effect of the sulphur showed itself from the beginning in the stronger growth and brighter green of the plants on the treated plots. This result persisted till the crops ripened.

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(1) See No. 780, *B.* May 1912, and No. 1397, *B.* October 1912. (*Ed.*).

The crop reaped on July 26 was weighed (grain and straw together). The average weight per plot of 2 sq. m. (2.4 sq. yds.) was as follows:

	Barley — lbs.	Rye — lbs.
Without sulphur	13.0	9.5
With sulphur	16.5	12.75
Increase due to sulphur	3.5	3.25

These figures clearly show the good effect of sulphur upon the cereals used for the experiment.

RICULTURAL BOTANY. HEMISTRY AND HYSIOLOGY OF PLANTS

235 - The Effect of the Concentration of Nutritive Solutions upon their Absorption by Plants.

POUGET, I. and SCHUSCHAK, D. Vlijanie conzentrazij pitatelmjeh rastorov na ich pog lostschenie rasteniem. — *Jurnal Opitnoi Agronomii*, Year XIII, Part 6, pp. 823-828 (828-829) + 3 figs. St. Petersburg, 1912.

The writers have investigated in the laboratory for Applied Chemistry of the University of Algiers the absorption by wheat plants 2 to 4 weeks old of various nutritive substances from solutions of different degrees of concentration and from aqueous soil extracts.

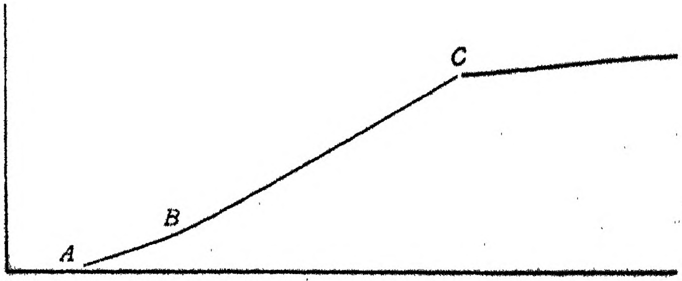
Their results, using nitrate nitrogen, were as follows:

I

Concentration of the solution in mg. nitrogen per litre	0.5	1	2	4	8	16	32	64	100	200
Nitrogen absorbed, mg.	0.04	0.11	0.2	0.41	0.8	1.61	3.2	6	8.5	15

II

Concentration at the beginning, mg. nitrogen per litre	0	0.5	1.0	2.0	4.0	8.0
Average concentration during the experiment, mg. per litre	0	0.43	0.87	1.65	2.70	5.1
Absorbed nitrogen, mg.	0	3.29	6.82	11.7	13.7	20.1
Plant weight (dried at 100° C.) mg.	0.364	0.399	0.418	0.433	0.414	0.428
Increase over plants grown without nitrogen	0	0.035	0.054	0.069	0.066	0.064



The writers summarize the total results of their experiments as follows:

Where the concentration of the solution was very low (under 0.1 mg. per litre for phosphoric acid) no absorption was observed; on the contrary, the plants excreted from their roots the nutritive matter which they had before absorbed in the organic or inorganic form (point A of the curve). With the rise in concentration, the absorption is at first more rapid than the increase in concentration, till it reaches a certain point (B on the curve); beyond this point the absorption is strictly in proportion to the concentration of the solution; subsequently a point is reached (C on curve) when this ratio is disturbed, and the absorption increases more slowly than the concentration rises; eventually, the absorption ceases to depend upon the concentration (the absorption of the nutritive substance from the solution is then regulated by its assimilation by the plant). It is clear that the positions of the points A, B and C upon the absorption curve depend upon the condition of the plants, their stage of growth, and upon external conditions (light, warmth, etc.). It should also be noted that with solutions of very low concentration, the nutritive substance is absorbed much more rapidly than water.

These results show that soil solutions, in spite of their great want of concentration, play a every important part in crop development, as has been shown by Schlösing (the younger) and the writers in the case of the assimilation of phosphoric acid.

If the concentration of the soil solution is higher, as regards elements necessary for the nutrition of the plant, than the limit of concentration C (see the above curve), the yield of the crop will depend upon other factors (climatic, biological, etc.).

If on the other hand a minimum quantity of one, or all, the nutritive substances is present and the concentration falls below the limit C, the absorption of the substance in question and therefore the yield of the crop will be strictly dependent upon this concentration.

236 - Transpiration in Plants in Relation to Atmospheric Humidity.

MONTGOMERY, E. G. and KIESSELBACH, T. A. *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Article VI, (*Bull.* 128), pp. 4-6. Lincoln, Nebraska, 1912.

The following experiment is a continuation of the work already reported by the writers (1). The same apparatus was used as before, but the cans containing the maize plants were put into two greenhouses, in one of which the air was kept as moist as possible, whilst the other was left open and therefore had a comparatively dry atmosphere. A record of temperature and relative humidity was kept, and the effect of the different conditions on the plants is shown in the following table:

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(1) 24th *Annual Report of the Agricultural Experiment Station of Nebraska*, pp. 91-107. See also No. 1647, *B.* June 1911. (*Ed.*).

	Dry greenhouse —	Humid greenhouse	Ratio: Humid to Dry
Mean temperature	85° F.	81° F.	—
Total dry weight of plants in grams	670	862	—
Total water used in kilogr.	278	184	—
Gr. of water per gr. of dry weight	340	191	1 : 0.56
Water evaporated from 36 sq. in. of free water surface (grams)	3 891	2 187	1 : 0.56

The plants in the humid greenhouse attained the greatest dry weight, though the total leaf area was approximately the same in both cases; but the amount of water used per unit weight of dry matter was almost twice as great in the dry as in the humid house and this ratio was reproduced exactly by a comparison of free water surfaces exposed in the two houses.

237 - The Wilting Coefficient for Plants in Alkali Soils.

KEARNEY, T. H. *United States Department of Agriculture, Bureau of Plant Industry, Circular* No. 109, pp. 17-25: Washington, January 1913.

The writer used the same apparatus as Briggs and Schantz in their experiments on the wilting coefficient of plants (1). Wheat seedlings were employed and a range of soils containing from 0.183 to 0.759 of water-soluble material per 100 dry soil. The results show that where plant growth is not entirely prohibited by excess of alkaline salts, the presence of the salts does not prevent the plant from drying out the soil to the same extent as when it is in a normal condition.

238 - Comparative Transpiration Experiments with Awned and Awnless Barley.

SCHULZE, G. W. Vergleichende Transpirationsversuche zwischen begrannter und grannenloser Gerste. — Aus dem Institut für Pflanzenzüchtung der k. k. Hochschule für Bodenkultur in Wien. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschul. für Bodenkultur in Wien*, Vol. I, Part 3, pp. 285-308 + 3 plates. Vienna, January 15, 1913.

The chief result of the transpiration experiments is the confirmation of the opinion held by v. Proskowetz and other investigators that naturally awnless varieties of barley have in comparison with the awned barleys an extraordinarily low energy of transpiration: under otherwise normal conditions, this reaches a maximum of only one-sixth of that of awned Hanna barley.

Further, in awnless barleys a continuous increase of transpiration was shown to accompany the development of the ears. In these experiments the maximum was reached at the milky stage.

The observation made during all the stages of development that the artificial removal of the awns from the ears did not place them on the same level with the awnless barleys in respect to transpiration, was attributed, by means of special experiments, for the most part to the increased loss of water due to the wounds.

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(1) See No. 903, *B* June 1912. *(Ed.*

The transpiration experiments made between *Hordeum vulgare* var. *trifurcatum* (hooded barley) and awnless barley gave, at the milky stage, a 40 per cent. lower transpiration for the awnless barley.

Experiments made with awned Hanna barley and the same artificially deprived of its awns, together with awnless barley under diffused light and in direct sunlight gave the following result: under direct sunlight awnless barley, in comparison with artificially awnless barley and especially with awned barley, transpired relatively more than under diffused light. The percentage figures obtained for the increase of transpiration at the milky stage under direct sunlight stood in the ratio of 44 : 38 : 19.

239 - Results of Selection on Wheat Yields in Nebraska.

SELECTION

MONTGOMERY, E. G. Wheat Breeding Experiments. — *Bulletin of the Agricultural Experiment Station of Nebraska*, No. 125, pp. 1-16. Lincoln, Nebraska, March 1912.

In 1902 the systematic improvement of Turkey Red Wheat was commenced at the Nebraska Experiment Station, this wheat having proved specially adapted to withstand the cold dry winters of that region.

The method of selection from single ears was adopted, and during the four years 1907-10, 26 pure strains thus obtained were tested in field plots. The average yields varied from 28.8 to 40.7 bushels per acre, whilst the control plots sown with the original stock of Turkey Red yielded 35.1 bushels per acre. The following year, seed of three of the most promising strains was distributed amongst farmers of the district. In each case the test plot was eight acres in extent and formed part of a larger field, so that the returns from selected and unselected seed could be compared. In the 21 tests thus made the local Turkey Red yielded on an average 21.9 bushels per acre, whilst the improved grain yielded 25.9 bushels per acre, showing a net gain of 4 bushels per acre.

The experiments are being continued and a new strain is now ready for distribution which appeers to be superior to any other so far tested, especially with regard to colour and quality.

240 - Asparagus Breeding for Rust Resistance.

NORTON, J. B. *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 263, 60 pp. Washington, January 1913.

The Massachusetts Asparagus Growers' Association was organised in 1900 to produce by breeding a variety of asparagus resistant to the rust *Puccinia Asparagi*. The cooperation of the United States Department of Agriculture was obtained, and breeding experiments were begun in 1908; they were conducted partly in greenhouses at Washington, D. C., and partly in the field at Concord, Mass. A large number of varieties both from America and Europe were planted, and in the autumn of 1908 the fields were inspected and all specially resistant plants marked, the work being repeated in 1909 and 1910.

A number of correlation studies were made between the various vegetative characters of the plants, so that as the work proceeds, the useless varieties can be recognised at an early stage and discarded. Moreover the tables show that the asparagus plant has a stable and permanent individuality and is well adapted to breeding work.

Further studies show that there is little relation between vigour, as measured by growth, and rust resistance, but that the latter quality is transmitted by resistant parents to their offspring. Two such parents, a male and a female, have given excellent results, and their progeny will be produced in large quantities for distribution.

CEREAL AND PULSE CROPS

241 - How Thickly Should Seed be sown on Mountain Farms?

WILLNER, M. Wie stark soll der Gebirgsbauer säen? — *Zentralblatt für Landwirtschaft* Year 93, No. 2, pp. 14-18. Brünn, January 16, 1913.

In 1911 and 1912, the writer made experiments on the two farms of Lessonitz and Watzanowitz in the south-west mountainous district of Moravia as to the best amount of cereal seed to sow; the results have been given by him in a series of tables. The estates are situated at 1300 to 2000 feet above sea-level; the soil is chiefly a somewhat sandy loam or loamy sand. Its content in nutritive matter is: nitrogen, 0.13 per cent.; phosphoric acid, 0.07 per cent.; potash, 0.35 per cent.; and lime, 0.3 per cent.; thus, except for the deficiency in phosphoric acid, it may be considered sufficiently rich to ensure good crops in favourable seasons.

I. *Wheat.* — In the year of drought 1911, the highest total and net production was obtained on both farms by sowing the largest amount of seed. At Lessonitz 225 lbs. of seed produced 32.2 bushels of grain and 36 cwt. of straw per acre; at Watzanowitz, with 170 lbs. of seed, the yield was 34.4 bushels of grain and 36 3/4 cwt. of straw. At Lessonitz, Strube's Schlanstedter Squarehead was grown and at Watzanowitz, Zborowitzer Squarehead.

In the wet year 1912, the maximum production was also obtained at Lessonitz by sowing the largest amount of seed, 202 lbs. per acre, *viz.* 43.1 bushels gross yield per acre, which corresponds (subtracting the seed) to 39.7 bushels net yield. The net yield of the next plot, which was sown with 170 lbs. of seed, was only a little less, *viz.* 39.1 bushels. At Watzanowitz, the experiments of 1912 gave less concordant results: the maximum yield of grain (49.6 bu.) was obtained by sowing 103 lbs. of seed; after this come the net yields of 48.0 and 44.6 bushels, resulting respectively from the sowing of 200 and 180 lbs. of seed. On both farms Strubes Schlanstedter Squarehead was the variety grown.

II. *Rye* — The variety sown on both farms was Von Lochow's Petkuser. In 1911, the highest yield on both farms was obtained with the largest quantity of seed (at Lessonitz 196 lbs., at Watzanowitz 160 lbs.); but at Lessonitz nearly the same net yield of grain was obtained with 160 lbs. as with 196 lbs. (28.7 and 28.9 bushels respectively). The yield increased with the increase of the seed sown also in the wet season of 1912, but the maximum crop was obtained with 160 to 196 lbs. of seed.

III. *Barley.* — In 1911, the barley (Melon) also yielded the maximum crop (36.0 bushels) when sown thickest (191 lbs.) But in 1912 the largest crop of Melon barley was obtained at Lessonitz from only

160 lbs. per acre. In the experiment at Watzanowitz (with Moravian barley) the yields obtained by sowing from 93 to 218 lbs. showed very slight differences.

IV. *Oats.* — In the experiment carried out in 1911 on both farms with Ligowo oats, the highest yields were obtained from the largest quantity of seed, *viz.* at Lessonitz 68.9 bushels from 160 lbs. and at Watzanowitz 55.8 bushels from 156 lbs. In 1912, the crops on both estates rose with the amount of seed sown. The largest yields of 54.4 bushels (Ligowo) and 78.5 bushels (Petkuser Yellow) were obtained by sowing from 160 to 180 lbs. of seed.

The writer considers that these experiments clearly show that, under the given conditions, in the case of rye, barley and oats the best crop is obtained with from 160 to 180 lbs. of seed per acre; for wheat, especially the Squarehead type, at least 180 lbs. must be sown to get the highest net yield.

242 - **Noltch's Imperial Barley cultivated in Hungary.**

RÖSZLER KÁROLY. Milyen árpát termeljen az alföldi gazda? — *Mezögazdasági Szémle,* Year XXXI, No. 1, pp. 35-37. Budapest, January 1913.

The writer, assistant to the Agricultural Station of Magyaróvár, shows that the variety of barley "Noltch's Imperial," so called after its first grower in Bohemia, M. Joseph Noltch, has proved to be most resistant against unfavourable weather. This variety was imported ten years ago by the Agricultural Station of Magyaróvár. It was distinguished at once for its early maturity and for the high yields which it can give.

The best results were those obtained in the fields of the Arad comitat:

	Date of maturity			Yield per acre		
	1903	1904	1905	1903 — lbs.	1904 — lbs.	1905 — lbs.
Hanna from Kwassitz	12.VII	12.VII	10.VII	1 063	960	667
» » Vodicka.	»	»	—	1 095	1 096	—
Noltch's Imperial. . .	»	»	8.VII	1 122	1 380	675
Farm Hanna.	»	»	9.VII	1 075	975	483

These results and others quoted by the writer show the superiority of Noltch's Imperial over the other varieties. In heavy clay soils it succeded always fully, whilst Hanna often produced grain only fit for feeding to stock. Consequently Noltch's Imperial is a favourite with brewers and always more extensively cultivated by the small Hungarian landowners. The weight per bushel is often 56.9 lbs.; last year it was 54.5 lbs. and the gross yield per acre was 1260 lbs.

The writer has conducted experiments with 8 varieties, and up to the present Noltch's Imperial has always been the most successful, whence he concludes that in heavy soils it will always be advantageous to cultivate this variety instead of the others.

243 - Cultivation Experiments with Spring Barley.

STÖRMER, K. Anbauversuche mit Samengerste. Mitteilung der Anstalt für Pflanzenbau, Stettin. — *Deutsche Landwirtschaftliche Presse*, Year XXXX, No. 5, pp. 47-48. Berlin, January 15, 1913.

For the last five years barley has been grown at Warsaw in the following rotation: 1) peas or beans; 2) winter wheat; 3) oats; 4) potatoes dunged; 5) barley; 6) winter rye; 7) beets dunged; 8) spring wheat. Considering the favourable conditions left by the preceding crop, barley has hitherto been manured only with 3 ¼ cwt. of kainit and 3 ¼ cwt. of basic slag per acre.

The averages for the varieties grown from 1908 to 1911 were as follows:

	bushels (1) per acre
Svalöf Princess	47.1
Svalöf Hannchen	45.9
Original Hanna (from Kwassitz)	44.0
Himmel's Golden Melon	43.2
Lerchenborger	43.1
Svalöf Imperial Primus	38.0
Magdalenen Chevalier (West Prussian)	37.7
Heydenreich's Goldthorpe	30.7

In 1912 barley-growing trials were made at Warsaw on good soils, at Stargard on medium soils, at Köslin on light soils, and at two other places in the province. The wet weather increased the danger from lodging and offered a good opportunity for judging the resistance to lodging of the several varieties. In this respect the Chevalier barleys failed most and thus occupy the lowest position both in yield of grain and in thousand-grain weight; Ackermann's Lower Bavarian also lodged a good deal. Imperial barleys behaved very well as regards resistance to lodging, but in yield of grain they were only average crops. The grain weight is in these kinds very high, and in the case of Noltch's Imperial it was the highest of all kinds grown. The best yields were obtained again, as in all the other experiments, from the barleys of the country. As winner Heil's Franken H 1 is to be mentioned; thanks to its resistance to lodging and to the fine development of its ears the extraordinarily heavy yield of 69.8 bushels per acre was reached. Svalöf Hannchen again took the second place, but its 1000-grain weight was not satisfactory; in yield Rimpau's Hanna was almost equal to it. The highest 1000-grain weight was attained by Heine's Hanna: 46.08 grams. Svalöf Princess failed completely this year, probably on account of the cold dry weather in spring. East Prussian Small Four-rowed gave the lowest yield; it is valuable only as a forage crop under special conditions, as it stands very late sowing, has a short period of vegetation and thrives on the lightest soils.

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(1) Calculated as bushels of 55 lbs. (*Ed.*).

244 – Rice Growing in Louisiana.

SPAHR (Hohensolms, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana (1). — *Der Tropenpflanzer*, Year 16, No. 12, pp. 633-645 + fig. Berlin, December 1912.

Rice Production in the United States.

State	Area under rice 1910	Rice crop 1911
	acres	bushels *
North Carolina	1 000	27 000
South Carolina	17 000	357 000
Georgia	4 000	88 000
Florida	900	19 000
Alabama	1 000	25 000
Mississippi	2 800	84 000
Louisiana	371 200	12 769 000
Texas	264 800	8 738 000
Arkansas	60 000	2 400 000
California	100	3 000

* About 45 lbs. of unhulled rice.

Rice cultivation was begun in Louisiana on the alluvial soil of the Mississippi and its tributaries. The water is conveyed over the levees directly into the supply-trenches, or more usually pumped into special basins, whence it is brought over the levees by siphons. The use of siphons has this advantage: as long as the basins overflow during periods of high water, the apparatus acts automatically and the expense, which is always great, is thereby diminished.

The chief hindrance to rice-growing is the impossibility of replacing costly manual labour by machinery; this is due to the fact that the land falls away rapidly from the river towards the swamps, which makes it necessary to throw up numerous flood dykes; and further, unfavourable conditions of the soil and of the period of flood hinder the complete drying of the fields.

About thirty years ago, rice-growing was attempted with great success in the prairie land of South-West Lousiana; this region produced seven-tenths of the United States rice crop in 1911 (which was 506 million lbs.). Naturally, the rainfall did not supply sufficient water for irrigation, but canals were made (730 miles long in 1911) for the conveyance of the necessary supply. Of late, this water has been paid for by a certain percentage, about one-fifth, of the crop. Districts which are at too great a distance from the canals can obtain water by boring down to a water-bearing stratum of gravel, which occurs at a depth of 150 to 300 ft. A bore-hole of 8 to 10 inch diameter usually supplies sufficient water for the irrigation of about 80 to 100 acres.

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(1) For the articles on cotton and sugar cane, see Nos. 125 and 128, *B*. Feb. 1913. (*Ed*.).

Varieties. — "Upland" rice is little cultivated; it is only used for local consumption and as a poultry feed. It grows on heavy soil, but only on such light soils as are low-lying and damp. After the ground has been prepared, the rice is sown in rows about 2 ft. apart. The soil has to be kept sufficiently wet and the growth of weeds checked. Work in the rice-field ceases with the appearance of the ears. Harvest takes place in August or the beginning of September. The varieties chiefly cultivated are Honduras and Japanese rice.

"Lowland" rice is the one usually grown in Louisiana; this belongs to the same type as the "Upland" variety. The cultivation of Carolina rice has fallen off much of late, for red rice (*Oryza sativa* var. *rufipogon*) often makes its appearance amongst it. The latter was a cross between the two varieties and the hybrids showed further mutations. Carolina rice is less resistant to disease than the foreign varieties. Some years ago, a Rice-Growing Experiment Station was established at Crowley; it is especially engaged in the selection of disease-resisting and hard-grained varieties; some of the varieties at present grown give on polishing up to 90 per cent. of broken grains.

Honduras rice only is grown in the alluvial district, while the Japanese variety is cultivated on the prairie. The former grows the more luxuriantly, but is more prone to lodging than the latter; it ripens earlier than Japanese rice and thus fetches higher prices. It is therefore becoming the practice in the prairies to plant both varieties in order to benefit by the early maturity of the one and to increase the length of harvest time.

Preparation of the soil. — The soil may be worked either dry or wet. In the former case it is ploughed in winter or early spring, and well broken up with the disc harrow in the case of heavy soil with clods; but where the soil is lighter the rotating toothed-harrow is used. If the soil is very hard to work (as on the prairie after fallow) the fields are irrigated, ploughed wet, and sown immediately afterwards. Ploughing in alluvial land is 2 to 3 inches deep the first year, getting gradually deeper each succeeding year. On the prairie some plough 6 inches, others only 3, as they reckon that deep ploughing makes harvesting heavier owing to the machine sinking too far into the ground.

The necessary dykes are thrown up by plough, mattock or spade; owing to the sharp fall of the alluvial land towards the swamps, the fields cannot be large and are often only 1 ½ to 2 acres, rarely 3 or 4, in size, though on the prairie they are larger.

Sowing. — In the alluvial district, sowing is usually done in late March or early April, with a broad-casting machine; 45 to 65 lbs. of seed are used per acre, and it is purchased fresh every year.

On the prairie, the Japanese rice is sown from early April to the middle of June, while the Honduras variety is put in as early as possible. The seed is usually drilled, which saves seed (40 to 50 lbs. being used per acre), and gives a heavier crop.

In wet cultivation the rice is sown in late April or early May, and the water is well mixed with the soil by means of mules drawing planks or bundles of branches. When the mud has settled over the seed, the excess of water must be drained off.

In normal seasons the rice is tall enough to allow of the field being flooded in five weeks, but in dry years it takes longer, sometimes even twice as long, to grow the required amount; recourse is then had to temporary irrigation. The field must be flooded without delay if weeds threaten to smother the crop; sometimes it is necessary to mow the whole field to the surface of the soil, and to irrigate at once; the rice sprouts again, but the weeds remain below the water and perish.

Irrigation is carried out in such a manner that the water flows on from one field to the others. In the alluvial district, the depth of water varies from 6 to 12 inches; in the highest parts of the prairie it is only an inch or so and in the lowest from 4 ½ to 7 inches. The writer does not advise flooding deeper than 4 inches, as too much water promotes lodging and decreases the crop.

The worst weed in rice-fields is red rice (*Oryza sativa* var. *rufipogon*); others are *Sesbania macrocarpa* Muhl. and *Aeschynomene virginica*, the last especially in the alluvial district. Weeding is done by hand; this work is readily performed by the negroes, adults being paid 80 or 90 cents and children 40 cents.

As soon as the rice begins to turn yellow and the ears to droop, the water is drawn off. A fortnight later, the crop is ripe for harvest; this occurs for the Japanese rice in the alluvial district in the middle of July and on the prairie at the beginning of August. The Honduras variety is cut earlier.

Harvesting. — In the alluvial district, the rice is cut with a sickle; the stubble is left standing till the rice dries. When cut, the rice is made up into sheaves and placed in heaps, where it remains till it is threshed. On the prairie binders are used; the writer recommends those made by Cavaliere Balbo Bertone (Turin), of which he gives a description.

Threshing is effected as soon as possible, so as to prevent damage by bad weather. Sometimes stacks are made of the size of a waggon-load; by this means the rice heats; as soon as the temperature has reached its maximum, it gradually falls and the stack dries, as does the grain, which becomes very hard and on husking is very white and brilliant. The rice is, however, not usually stacked to improve the quality of the grain, but from necessity, when no threshing machine can be got, or if bad weather sets in. In such cases the stack is often built on a wooden platform.

Yield. — The average crop is 10 to 20 sacks of 162 lbs. of unhusked rice per acre, minimum 6 sacks, maximum 27 sacks. In 1911, there were 35 rice-mills in Louisiana. The straw is used sometimes as forage, otherwise it is left on the field, or burnt.

In rainy seasons, the rice stubble soon sprouts again and is cut green, when it makes a valuable feed; if the harvest has been bad, however, this second crop may also be allowed to ripen and it amounts to about one-eight of the normal first harvest.

Rice is seldom grown more than four years in succession on the same field. When aquatic weeds get very bad, the field may be left fallow for two or three years. Fertilizers are practically not used.

Enemies of rice. — Rice mildew (*Pyricularia oryzæ* Bri. and Cav.) occurs chiefly in the south-west of Louisiana, where it causes a loss of from 5 to 25 per cent. of the crop. There are no efficacious means of controlling this fungus. The most resistant varieties are Honduras and Japanese rice.

Obalus pugnax Fabr. and other insects of the same family (Pentatomidae) bore into the grains and extract the juice. The wounds afford good points of attack for fungi and bacteria, which develop and form black patches. The loss occasioned is from 10 to 25 per cent. No good remedy against these enemies is known. Japanese rice suffers more than does the Honduras variety.

Rice-birds (*Dolichonyx oryzivorus*) also do great damage in places.

245 – *Phaseolus lunatus* Beans.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 653-655. London, December 1912.

A death which recently occurred on the Dankanda Estate, Matale, Ceylon, through eating the beans of *Phaseolus lunatus*, which bear the local names of *Veli Bonchi* (Tamil) and *Potu Dambala* (Sinhalese), gives point to the warnings that have been repeatedly published during the last ten years as to the dangerous nature of the beans produced by certain varieties of *P. lunatus*. The following four kinds of these beans are known:

1. Medium-sized, rather flat, somewhat shrivelled beans, varying in colour from dull purplish-red to nearly black. This kind is represented by the "Java beans", which were imported some years ago to various European countries, and caused numerous cases of poisoning among cattle fed with them (1). These beans yield comparatively large quantities of prussic acid when ground and moistened with water. This variety is only fit for use as a green manure.

2. Small reddish beans, which are usually plump and occasionally show purple spots. This variety is represented by the "red Rangoon" or "red Burma" beans, which are largely exported from India. When ground and mixed with water they yield minute and usually harmless amounts of prussic acid. So far as is known, no poisoning case has arisen from their use.

3. Small white beans, usually plump. "White Rangoon" or "white Burma" beans belong to this kind. They generally yield mere traces of prussic acid.

4. Large plump white beans. This variety is represented by "Lima beans", which are largely cultivated in the United States, Southern Europe, Madagascar and elsewhere for use as a vegetable. Numerous samples of this kind have been analyzed; and only a few yielded mere

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(1) See No. 2263, *B.* July 1911; No. 792, *B.* May 1912. (*Ed.*).

traces of prussic acid, most of them showing none at all. This variety seems perfectly safe for use as a human foodstuff, though wherever it is grown for the first time samples from the first few crops should be analysed in order to ensure that no deterioration to a less desirable variety has occurred.

Recent statements in the Indian Press express a fear that the export of Burma beans is doomed to extinction. The writer notes that the export trade of these beans is still flourishing, notwithstanding the fact that the discovery of the poisonous nature of some of these beans was made at the Imperial Institute as long ago as 1903.

These beans are regarded with some suspicion by experts and they command comparatively small prices in the market. In view of this, the Imperial Institute has recently suggested to the Department of Agriculture in Burma that steps might be taken to encourage the natives to cultivate a better class of beans for export, and samples of the kinds of product required have been forwarded for trial cultivation.

246 - Yam Growing in Jamaica and in Queensland.

ROOT CROPS

1. SOMERVILLE, R. C. Yam Growing in Hanover. — *The Journal of the Jamaica Agricultural Society*, Vol. XIV, No. 12, pp. 648-650. Kingston, December 1912.

2. Growing Yams. — *The Queensland Agricultural Journal*, Vol. XXX, Part 1, pp. 45-46. Brisbane, January 1913.

1. *Yam Growing in Hanover, Jamaica.* — The yam tuber takes the foremost place of all the vegetable foods grown in Jamaica in the diet of the labouring classes. In every parish it is grown to a greater or less degree, but the methods of planting and cultivating differ considerably in the various districts. The most important yam-growing centre is Hanover, which produces the Lucea yam or, as it is called in Hanover, " Doctor Dick ". This variety thrives best in Hanover, although it gives satisfactory results in Upper St. James, Westmoreland and some parts of Portland.

The plants are spiny; the tubers are white when cooked and of regular shapes; they keep well, pack easily and are resistant to transport. In Upper Hanover the yam fields are situated on the slopes of the mountains which are too steep for bananas. The hills are dug very close together, 2000 to the acre. Two " bits " (extremities of the tubers), each with an eye, are planted in each hill. The Doctor Dick requires tall sticks for support. A good worker can dig 150 hills per day. The average yield per acre is about 4 tons, but under very favourable conditions as much as 6 tons can be harvested.

The cost of cultivating one acre of yams is the following:

	£	s	d
Rent	1	0	0
Cutting and cleaning	2	0	0
Digging 2000 yam hills including planting	2	10	0
2000 sticks	1	0	0
Sticking out yams		10	0
Two weedings	1	0	0
Total cost . . .	8	0	0
Carriage to the port of Lucea .	4	0	0
Total cost of the produce of one acre of yams at the port .	12	0	0

The yams are sold in Lucea at £8 per ton, bringing in a gross income of £32.

The cost of buying plants is left out as that once done the grower will always have enough to plant.

It has been calculated that the yam industry means an income of £40 000 annually to Hanover.

Another variety of yam is also cultivated in Hanover; The "Afou" or yellow yam; it is a great favourite in the local markets, but it will not keep long and is therefore useless for foreign trade.

It is planted even closer than Doctor Dick and requires short sticks.

2. *Yam growing in Queensland, Australia.* — In the early days, when some thousands of kanakas were employed in the Queensland sugar plantations, yams were largely grown, as they formed part of the labourer's rations. Since black labour ceased in the State, the cultivation of the yam has fallen off. The tuber, perhaps owing to its glutinous nature, is not much appreciated by the white population. The yam requires a warm damp climate to be produced to perfection, but it thrives under conditions where the sweet potato would not do so. It is propagated by setts from the roots, or by small bulbs which are planted in rows 3 feet apart, the setts being at the same distance from each other. The best planting season is September, and the crop will be ready in from five to eight months. After planting a stout stake is set near each hole. The Papuan natives, who grow large quantities of yams, often lay branches over the setts and allow the vines to run over them, thus giving the plants air and preventing a luxuriant growth of weeds. The after cultivation is trifling and consists in weeding and loosening the soil; and where poles are used, the cultivator can be run between the rows, and with a Dutch hoe the weeds can be destroyed close up to the plant.

The best known edible kinds are *Dioscorea bulbifera*, *D. aculeata* or Guinea yam, and *D. globosa*, the last being the kind most highly esteemed in India. The bulbs of *D. rubella* attain a length of 3 feet. *D. alata* (the winged yam) is the most productive. The Cush-Cush Yam (*D. try-*

phylla) is called in Jamaica the Indian Yam, and in British Guiana it is known as the Buck Yam. The tubers are roundish and rarely exceed 9 inches in length and 3 in. in diameter. It is the smallest and most delicate of all the yams. The plant is prolific, sometimes bearing a dozen tubers on the roots.

247 - A New Variety of Rye Grass.

FORAGE CROPS. MEADOWS AND PASTURES

The Journal of the New Zealand Department of Agriculture, Vol. 5, No. 5, pp. 484-486. Wellington, N. Z., November 1912.

The Western Wolths Grass is a variety of Italian rye grass said to have originated from a plant plucked from the roadside by a Dutch peasant. It is characterised by its extremely rapid and vigorous growth, and in the past season, at the Ruakura Farm of Instruction, yielded 15 tons of forage per acre at the first cutting. It has proved excellent feed for dairy cattle and provides several good subsequent cuttings. The seed is indistinguishable from ordinary Italian rye grass, and buyers should be careful to purchase seed guaranteed true to type.

248 - The Cotton Industry of Nyasaland.

FIBRE CROPS

Bulletin of the Imperial Institute, Vol X, No. 4, pp. 527-536. London, December 1912.

The introduction of cotton growing into Nyasaland is of comparatively recent occurrence, a few consignments being exported for the first time in 1902; but already a large industry has been worked up, the rapid growth of which may be judged from the following table:

Years	Quantity lbs.	Value £
1902-1903.	692	No complete returns
1903-1904.	58 897	1 778
1904-1905.	285 185	5 941
1905-1906.	776 640	16 180
1906-1907.	526 119	15 345
1907-1908.	403 486	13 998
1908-1909.	756 120	28 355
1909-1910.	858 926	26 209
1910-1911.	1 736 999	58 687

In the early days of the industry all kinds of cotton were grown, but many of these were unsuited to the climatic conditions of the Protectorate: and owing to the different varieties being grown in proximity hybridisation was common, resulting in the deterioration of those types which, under proper conditions, would have given good results. The only types now grown on a commercial scale are Egyptian varieties which are confined to the warmer districts of the Lower river, and long-stapled American Upland forms, which are cultivated only on the higher lands. As a general rule Egyptian cottons are grown in Nyasaland at elevations below 2000 ft., and the American kinds from 2000 to 4000 ft.

By careful selection of "improved" American Upland varieties, a type of cotton has been evolved which has now become acclimatised and is recognised as a distinct commercial variety under the name of "Nyasaland". At the present time this cotton is regarded as the best grown in Nyasaland from Upland seed. Of the total area under European cultivation in the Protectorate in 1912, 23 000 acres were devoted to Nyasaland Upland and 755 acres to Egyptian cotton.

Accounts of the cotton industry in Nyasaland and of the selection experiments with Nyasaland Upland cotton have been given in the *Bulletin of the Imperial Institute* of 1909, 1910, 1911 and 1912. A summary of the results of the examination of cotton samples from Nyasaland was published in a *Report on British Cotton Cultivation* (No. 50, *Colonial Reports, Miscellaneous Series* [Cd. 3997] 1908).

The article under review refers to the results of the examination of the samples received in the last few years and belonging to the "Improved American Upland", Egyptian (Mitafifi, Abassi, Nubari) and Brazilian varieties.

249 - Ramie.

DEWEY, LYSTER H. — *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 103, pp. 9 + 2 figs. Washington, December 27, 1912.

Experiments in the cultivation of ramie have been carried on in the United States since 1860. Although none of them so far have led to a commercial industry, several kinds of ramie goods are appearing in increasing quantities in the American markets. Some mills are now engaged in the manufacture of these goods and others are being equipped for the work.

Ramie is cultivated commercially in China, in Japan, including Taiwan (Formosa), in Chosen (Korea), and to a limited extent in India and Africa.

Numerous experiments have demonstrated that it can be grown on suitable soils from Maryland to Texas ; also in California and Porto Rico.

A warm, moist climate is essential for the successful cultivation of ramie : warm temperate climates rather than the tropics. Unless grown under irrigation or on moist bottom lands it requires at least 40 inches of well-distributed rainfall. It requires a rich, deep, moist soil, well drained, yet not subject to drought. The following data were obtained by Prof. E. W. Hilgard at the California Agricultural Experiment Station.

Ramie is propagated by root cuttings or by seeds; in the former case they grow more quickly and with more certainty. The seed beds must be covered with a cloth to keep the atmosphere warm and saturated with moisture. When 6 to 10 weeks old the seedlings may be transplanted to a nursery, and two months later they may be set out in the open field at 20 to 30 inches apart in rows 3 to 4 feet apart. The land between the rows must be cultivated. If irrigated, the furrow system must be used to avoid covering the young plants with water.

Soil ingredients (in pounds) withdrawn from 1 *acre by a crop of ramie.*

Soil ingredients	Leaves (8 500 lbs.)	Stalks (14 500 lbs.)	Bark (5 500 lbs.)	Whole plant (28 500 lbs.)
Potash	68.13	155.99	27.86	251.98
Soda	8.90	33.63	7.52	50.14
Lime	566.91	71.77	19.14	657.82
Magnesia	114.58	43.68	10.01	168 27
Manganese oxide	1.92	1.45	0.20	3.57
Ferric oxide and alumina .	38.56	12.16	0.71	51.43
Phosphoric acid	77.13	67.71	10.86	155.70
Sulphuric acid	30.86	14.53	3.17	48.56
Silica	692.71	7.06	4.48	704.25
Chlorine	41.56	2.50	7.79	51.85
Total ash constituents . . .	1 641.35	410.85	91.74	2 133.57
Nitrogen	206.10	105.85	57.75	369.70

The first stalks of ramie are usually much branched and of no value. It is best to cut off the first shoots when they are 10 to 30 inches high to induce a thicker and more uniform growth of shoots. Afterwards one to four, usually two, crops are cut each year. In Asia each stalk is cut as it matures, leaving the younger stalks to grow. If the ramie is to be decorticated green it must be stripped immediately after being cut ; if the operation is to be carried out when dry the ramie should be cured in the swath or gavel and care must be exercised to avoid heating or molding. The strips of bark with the fibre are called " ramie ribbons ". The hand-cleaned fibre free from the bark and pulp is called " China grass ". The fibre in order to be spun is degummed by chemical processes and then combed to remove the short fibres or " noils " from the long ones or " tops ". Both tops and noils are spun.

The yield of stalks usually increases up to the fourth year. The following data are based on numerous experiments made in France:

Yield of ramie stalks and fibre in pounds per acre.

Year	Green stalks	Air-dry stalks	Dry fibre
First	6 000	1 500	300
Second	12 000	3 000	600
Third	18 400	4 600	900
Fourth	26 400	6 600	1 300

The production of raw fibre from two annual cuttings in experimental plantings ranges from 500 to 2800 lb. with an average (eight different authorities) of 1293 lb. The yield of dry fibre is 3 to 5 per cent. of the weight of the green stalks, or 15 to 20 per cent. of the air-dry stalks. In Formosa, where three or four crops are harvested each year over about 5000 acres, the average annual yield is about 700 lb. per acre. In Hunan, and Hupeh, China, the annual yield is 400 to 600 lb. of China grass per acre from three crops.

The ramie fibre, cleaned by hand in China, can be delivered in San Francisco or New York at 6 to 10 cents (about 3*d.* to 5*d.*) per pound. It is roughly estimated that the importations of China grass into the United States now amount to nearly 1 000 000 lb. annually, besides considerable quantities of yarns and some degummed filasse from Europe. Hongkong is the principal shipping port for the fibre.

The cultivation of ramie is limited to the countries having cheap, skilled hand labour; this is chiefly due to the lack of satisfactory mechanical methods for separating the fibre. Recently some European firms have put on the market some machines for this purpose, and some very promising work was done in trials with a machine built in the States to decorticate ramie fibre from the dry stalks. Fibre decorticated from green stalks is desired for most degumming processes, and machines are now being perfected for this work.

The outlook for the ramie industry in the United States appears promising. The question, however, remains whether this fibre can be produced at a cost permitting it to compete with the Chinese fibre.

250 – The Cultivation of Sisal Hemp in German East Africa.

Die Sisalkultur in Deutsch-Ost-Africa. — *Verhandlungen des Vorstandes des Kolonial-Wirtschaftlichen Komitées*, No. 2, pp. 39-48. Berlin, December 5, 1912.

This paper is the result of a journey of investigation undertaken by Dr. W. F. Bruck.

Importance of the Cultivation. The cultivation of *Agave sisalana* (Sisal Hemp) in German East Africa, where it has been introduced only within the last twenty years, has already proved to have a sure future before it, and to be specially suitable to the country. In 1911, 11 035 tons of sisal fibre worth £220 000 were exported from the Protectorate. For 1912 an exportation of at least 16 240 tons was reckoned upon, at a price of £34 17*s* 6*d* per ton for the best quality, and it is calculated that the yearly export will soon attain 20 000 tons, worth about £500 000.

Soil. — *Agave sisalana* thrives in German East Africa under the most various conditions of soil and of climate: on the fertile soils of the Usambara mountains; on the red loams produced by the disintegration of gneiss; on the calcareous soils of the coast, sometimes also red and derived from the desintegration of coral rocks; and on the typical steppe soil (near Kilossa). As for the quality and quantity of the fibre produced, the best results are those obtained on medium and poor soils.

Cultivation. — *Agave sisalana* is important in German East Africa only as a cultivated plant. It is generally propagated by means of suckers, mostly about 20 inches long and which develop better the older they are. They are generally planted out at once, being rarely put into a nursery. In soils that are not too rich the first cut may be made after three years. As a rule cropping goes on for five to seven years; a plantation lasts about ten years. This holds true for medium soils; in the rich virgin soils the crop begins earlier; thus, in the Usambara district the first cut may be made eighteen months after planting, but the plant may be exhausted after three years. In very poor soils, for instance on the coast (limestone or rocky soil), the first crop is secured only 4 or 5 years after planting, but the plants live much longer.

In careful cultivation the suckers which form around the base of the adult plants are removed; in neglected or " wild " plantations, as the writer calls them, they are allowed to grow. With the latter system the crop of leaves is heavier but they and the fibre they yield lack uniformity. Besides, it hinders the removal of weeds, which overrun the whole ground and very probably favour the actions of fungus and other pests. Careless cultivation, it is believed, can also lead to the degeneration of the Agave. In Java the species is already partially degenerated. The writer recommends regular cultivation at certain distances between the plants and with systematic weedings.

If other plants are not grown between the rows the agaves should be planted 4 ft. to 7 ½ ft. apart, according to the soil. For planting between the rows cotton has often been adopted; in particularly suitable localities this has given good results, defraying a good deal of the cost of planting and working before the principal crop began to bear. But where there is no certainty of a rainy and a dry season, mixed plantations are not advisable. As normally sisal hemp does not yield such large profits as other tropical crops, and as on the other hand the Colony has no lack of virgin soils, the writer advises, for the present, the extensive rather than the intensive cultivation of the plant.

For the improvement of exhausted lands, Leguminosae might be sown between the rows or fallowing resorted to.

Production and economic considerations. — As a rule each plant should give 200 leaves suitable for the extraction of fibre, which must amount to 3.5 or 4 per cent. of the leaves and be of good quality. The Krupp scutching machine works satisfactorily.

In making an agave plantation the estimates must be based on a production capable of supplying sufficient material to keep one or two scutching machines uninterruptedly going, calculating on 100 000 to 120 000 leaves per day per machine for 300 days per annum.

The Colony disposes of land suitable for a further extension of sisal cultivation, but this is checked by the want of labour. There is no fear at present of an excess of production, as with prices at £22 10*s* to £27 7*s* 6*d* per ton sisal hemp is a very profitable crop in plantations systematically cultivated. Besides, if the example of Mexico were followed—where sisal has been cultivated for the last forty years—alcohol, wax, oxalic acid, compressed fuel and paper could be prepared from the by-products remaining after the extraction of the fibre.

251 - The Hemp Industry.

FERRIS, W. H. in *The Journal of the New Zealand Department of Agriculture*, Vol. 5, No. 5, pp. 516-517. Wellington, N. Z., November 1912.

The production of *Phormium tenax* is diminishing in importance in the Auckland district. With better drainage of the great northern swamps it was expected that the production of fibre would expand, but with the development of drainage the swamp lands are proving valuable for agricultural purposes and the *Phormium* plant is gradually disappearing. It is still produced to a considerable extent in the Tawa Swamp (between Te Awamutu and Te Kuiti) and in the swamps on the east coast; but generally there is small chance of fibre extraction proving a stable industry in the north of New Zealand. Auckland *Phormium* is practically unaffected by disease, but it is inferior to the southern leaf. It is more irregular in length, while the fibre is not so strong.

On the other hand, in the northern Manawatu, *Phormium* covers about 15 000 acres of land in one solid block, which it will occupy until means have been devised to prevent its periodic flooding by the Manawatu River. The huge quantities of leaf surrounding the mills enable the cost of production to be reduced to a minimum and afford mill hands a guarantee of employment, thus providing better qualified labour and encouraging millers to erect up-to-date mills.

Considerable activity in the fibre industry is being displayed in the south of New Zealand. In several cases mills are being equipped with the latest labour-saving machinery. The installation of the automatic washing-machine has considerably improved the colour of the fibre and effects a saving of time.

252 – "Assa-peixe" of Brazil: Substitute for Hemp.

DE MORAES, PASCHOAL. Un precioso succedaneo do Canhamo, etc. — *Chacaras e Quintaes*, Vol. VI, No. 6, p. 12. São Paulo, Brazil, December 1912.

This plant, which grows wild in Brazil, where it is known as "Assa-peixe", appears to be *Boehmeria caudata* Swartz; it grows in abundance in all the north of Brazil, covering extensive areas; its stem frequently attains the height of 6 feet and is used in Bahia for trifling purposes; but its fibre, which for its tenacity and abundance would deserve to be worked, is neglected. "Assa-peixe" is a very hardy plant, having very moderate wants in the matters of the nature of the soil, quantity of rainfall, cultivation and manuring.

253 – General Review of the Beet Sugar Industry in the United States.

SUGAR CROPS

CLARK, W. B.: *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 260, pp. 15-30. Washington, November 1912.

From a consideration of results obtained in Europe, the most favourable regions for the growth of sugar beets in the United States were predicted to lie on either side of the summer isothermal line of 70°F., and at the present time the industry has developed in three main localities within this area:

1. *The Californian Region*, in southern and central California.
2. *The Intermountain Region*, chiefly in Colorado, Utah and Idaho.
3. *The Great Lakes Region*, in Michigan and Wisconsin, with the adjacent parts of Ohio, Indiana and Illinois.

Besides these there are a few scattered factories, some of which give indications of considerable future growth.

The rainfall varies widely within these regions. It ranges from under 10 in. per annum in the semi-arid parts of the Intermountain Region, where beets can only be raised with irrigation, to 30 or 35 in. in the humid climates of the Great Lakes Region. The length of the growing season, excluding subtropical districts of California and Arizona, varies from 130 to 170 days. The cost of growing an acre of sugar beets is computed at from $ 32 (£6 11*s* 6*d*) to $ 43 (£8 16*s* 9*d*), excluding the rent of the land; and the yields vary from 8 to 13 short tons (7 to 11 ½ English tons) per acre. With regard to the bye-products: the tops are utilized by feeding them green in the field, and their market value is reckoned at $ 2 to $ 4 (8*s* to 16*s* 6*d*) per acre; the exhausted pulp is sold as cattle food either in a wet, fermented state, worth 25 to 35 cents per ton., (1*s* 2*d* to 1*s* 7*d* per ton), or in a dried condition at about $ 15 a ton., (£3 9*s* per ton); molasses are produced only in small amounts and sell for about $ 10 a ton (45*s* per ton.); lastly, the lime and waste water are not put to any economic use at present.

During the last 25 years the home-grown beet-sugar crop has risen from nothing to one-eighth of the total home consumption — the acreage harvested in 1911 being little less than 475 000 acres. It is estimated that if less than 1 per cent. of the improved land in the States in which it is known that sugar beets can be successfully grown were planted with this crop, it would be unnecessary for the United States to buy any foreign sugar.

254 - Improvement in the Shape of Sugar Beets.

SEVERIN, C. De l'Amélioration de la forme de la betterave à sucre. — *Journal d'Agriculture Pratique*, Vol. I, Nos. 1 and 2, pp. 11-12 and 48-50. Paris, January 1913.

Some experiments were undertaken in order to estimate the part played by the shape of the root in the labour of harvesting the crop. The root was seized just below the crown by a clutch to which a dynamometer was attached; it was then pulled, and the work done in the operation thus recorded. Each root was subsequently weighed.

The nature of the soil naturally has an important effect on the results obtained, but in the same field the long tapering beets or those with fangs or lateral roots gave a much higher figure than the short globular ones. When the results are reduced to traction in pounds per unit weight (lb.) of root, the average figures for the different varieties varied from 64.4 lbs. to 89.8 lbs. Analyses of these two extreme cases showed that the quality of the root was in no way connected with the shape; so that, with care in selection, it is reasonable to hope that varieties may be obtained which will considerably reduce the labour, and consequently the cost, of harvesting the crop.

255 - The Insect Visitors of Beet and Mangold Flowers (1).

UZEL, HEINRICH. Ueber die Insekten, welche die Blüten der Zucker- und Futterrübe besuchen. — *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXXVIII, Part 4, pp. 182-197 + 2 figs. Prague, January 1913.

Recalling the experiments of K. Andrlik, V. Bartôs and J. Urban (2), who demonstrated that beets possessing a high sugar content give rise to descendants with lower sugar content when they are crossed with beets containing less sugar or worse still with mangolds, the writer observes that the opinion that beet flowers are anemophilons is widely spread, while both direct observation and the structure of the flower and of the pollen show that insects play a great part in the fertilisation of beets. In fact, the flowers have nectaries and they are scented; the pollen has a rough surface and is very sticky. There are species of insects which regularly visit beet and mangold flowers; they consequently render undesirable crosses, even at great distances, possible. Such insects seek chiefly nectar and subordinately pollen; some devour or suck the flowers and the other parts of the flower clusters; while others again prey upon the insect visitors. All come into contact with the pollen and all of them can carry it about.

In Bohemia, on the flowers and flower clusters of sugar beets great numbers of the following insects may be observed: in the first place

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(1) See No. 1168, *B.* Aug. 1912. (*Ed.*).

(2) See No. 121, *B.* Jan. 1911. (*Ed.*).

Thrips communis * Uzel; then the flies: *Syritta pipiens* * L., *Sarcophaga carnaria* * L. and *Ceratopogon bipunctatus* * L.; after which follow the Hemiptera: *Lygus campestris* L., with its larvae, *Calocoris lineolatus* Goeze, *Campylonum verbasci* H. Sch.; the Cicadid *Chlorita flavescens* Fab.; lastly the Coleoptera: *Sitona sulcifrons* Thunberg and *Apion virens* Herbst. The writer has observed in fairly considerable numbers the Thysanoptera: *Physopus atrata* * Halid., *P. vulgatissima* * Halid. and *Aeolothrips fasciata* * L.; the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab.; the Hemiptera: *Triphleps nigra* Wolff.; the Tenthredinid *Athalia spinarum* * Fab. and the Podurid *Sminthurus luteus* Lubb.

The following are not frequent. Diptera: *Sciara pallipes* Fbr., *Scatopse pulicaria* Lw., *Oscinis pusilla* Mg., *Phorbia platura* Mg.; Coleoptera: *Fachyporus chrysomelinus* L., *Sitona lineatus* L., *Apion seniculus* Kirb., *A. apricans* Herbst. and *Phyllotreta nigripes* Panz.

The following are rare. Coleoptera: *Stenus ater* Mannh., *Tachyporus hypnorum* F., *Meligethes aeneus* F., *Sitona hispidulus* F., *S. humeralis* Steph., *Apion varipes* Germ., *A. aestimatum* Germ. (= *trifolii* Bach); Diptera: *Onesia sepulcralis* Mg., *Sarcophaga vagans* Mg., *Melanostoma mellina* L., *Hylemyia cinerella* Mg., *Chlorops didyma* Ztt., *Phorbia humerella*, *Sciara flavimana* Ztt., *S. pulicaria* Mg., *Simulia maculata* Mg., *Sepsis cynipsea* L., *S. punctum* Fbr., *Clasiopa obscurella* Fall. and *Syrphus balteatus* Deg.; lastly the bee *Halictus pauxillus* F., and species of the families Proctotrupidae and Chalcididae.

As for mangold flowers, the writer has observed that in Bohemia they are visited with the greatest frequency by the flies: *Syritta pipiens* * L. and *Sarcophaga carnaria* * L., to a certain extent also by the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab. All these species often visit the flowers of sugar beets also. On the mangold flowers in isolated cases the following flies have been observed: *Sarcophaga striata* Fab., *S. haematodes* Mg., *Exorista vulgaris* Fab., *Cynomyia mortuorum* L., *Spilogaster duplicata* Mg. and *Hylemyia variata* Fab.

Next follows a description and considerations on the life history of the insects which visit in great numbers the flowers of sugar beets, or stay on them. Some of these insects visit mangolds also.

The following species are found in great numbers on the flower clusters of sugar beets; they suck the juices from the stem, the leaves and the flowers or devour these parts. Coleoptera: *Sitona sulcifrons* Thunb. (especially injurious to young leguminous plants), *Apion virens* Hbst., *Phyllotreta vittula* Redt.; Hemiptera: *Lygus campestris* L. (often injurious to colza, rape, dill, parsnips, chrysanthemums and dahlias; it is believed that the allied species *L. pratensis* (1) causes notable damage to sugar beets in North America); *Colocoris lineolatus* Goeze (sometimes especially injurious to hops and in a lesser degree to potatoes, cabbages and ornamental plants); *Campylomma verbasci* H. Sch.; *Triphleps minuta* Wolff (observed by the author to chase Thysanoptera; in North America Thysanoptera are preyed upon by *Triphleps insidiosa*); the Cicadid *Chlorita flavescens* Fab.; the Podurid *Sminthurus luteus* Lubb.

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* The asterisks denote the species which are frequent in the flowers or on them. (*Author's note.*)

(1) See No. 1381, *B.* Sept. 1912. (*Ed.*)

The writer lastly quotes the works he has consulted for the compilation of his paper.

OIL CROPS.

256 - Baobab Oil.

REY H. Notice sur l'huile de Baobab. — *Bulletin Economique de Madagascar et Dépendences*, Year 12, No. 2, pp. 135-140. Tananarive, 2nd Half-year 1912.

The baobab (*Adansonia digitata L.*) presents in the Sakalave Menabe country three varieties: "rainiala", "fony" and "zaha". The fruit of the first variety is oblong, covered when ripe with a thick fine brown down; that of the second is round, slightly velvety and dark green, while the fruit of the third variety is long and ellipsoidal in shape; its skin is thick, wrinkled and black when ripe.

These trees attain gigantic dimensions; "rainiala", the largest of all, ordinarily reaches a height of 40 to 50 feet, and the average circumference of its trunk is 20 to 23 feet. But these dimensions are frequently surpassed.

"Zaha" is the first to bloom, "fony" is the second and "rainiala" the third. The best time for gathering the "zaha" crop is the first fortnight of September; for "fony" the second fortnight of October and for "rainiala" the month of November.

For the extraction of the oil the natives free the nuts from the pulp which envelops them; they then crush them in a rice mortar and place the compact mass thus obtained in a vessel and cover it with 8 to 10 inches of water. It is boiled over a brisk fire for the first half hour and then gently for several hours. The oil begins to appear about two hours after the vessel has been placed over the fire, and about eight hours are required in order to obtain the maximum yield of oil.

Yield of fruit and seeds. — The following data give the averages of the yield of each variety:

	Rainiala	Fony	Zaha
Number of fruits per tree	80	70	60
Average weight per fruit in oz.	10	7	7
Average number of seeds per fruit	95	100	75
Average weight of seeds in 100 fruits in lbs.	22	15	11
Average quantity of oil per 100 lbs. of seeds in gals.	1	0.6	0.5

It must be added that for the same variety the fruits are more numerous and larger on the trees growing on rich soils, and that by the use of European machinery for extracting the oil by means of pressure, the amount of oil for the same weight of seeds may be quadrupled.

The above table shows the commercial superiority of "rainiala" over the other two varieties for its greater number of fruit and more abundant yield of seeds and of oil. The "zaha" variety, notwithstanding its lower production and the difficulty of treating the fruit (owing especially to the thickness of its rind and to the dense fibrous network that fixes the seeds to the pulp) may nevertheless be taken into consideration for its oil, as the fructification of these three varieties extends over several weeks.

Chemical composition and industrial value of the oil. — M. Millian, Director of the Laboratory of the Colonial Garden, has studied Baobab oil and seeds. The oily seed has the shape of a hazel nut encased in a thin resistant shell adhering to the pulp, which represents about 20 per cent. of the weight of the seed. In the centre there is a white pulp capable of yielding oil by pressure; the rest is a kind of flour without starch. These three constituents are found in the following proportion:

Oil	39.01 per cent.
Moisture	7.20 "
Shell and dry flour	53.78 "
Total	99.99

The seed does not contain any injurious product, so that the cake obtained by pressure might be used as food for live stock. The expressed oil has a fine yellow colour, its odour is pleasant; it solidifies at 13° C. and is especially rich in fatty acids solidifying at normal temperatures; the liquid part appears to be exclusively formed by oleic acid, while the solid part is a mixture of stearic and palmitic acids. The oil could be used for food or for the preparation of artificial butters and margarine, and it might take the place of olive oil in pharmaceutical preparations and in perfumery. It would be very suitable also for making fine soaps, stearin and lubricants.

Harvest and yield. — In order to gather the fruit the Sakalaves drive wooden pegs into the trunk, situating them so as to form a ladder by means of which they reach the top of the tree; they then use poles to knock the fruit down.

The following table gives the yield in oil from a ton of seeds and its cost according to the process used, *viz* the European or the native.

Variety	Native process	European process
Rainiala	Maximum yield 22 gals. Average price per gal. *7s 2d*	Minimum yield 79.2 gal. Average price per gal. *1s 6d*
Pony	Max. yield 13.2 gal. Average price per gal. *11s 8d*	Min. yield 48.4 gal. Average price per gal. *2s 5 ½d*
Zaha	Max. yield 11 gal. Average price per gal. *14s 5d*	Min. yield 39.6 gal. Average price per gal. *3s 6d*

Baobabs are found in abundance in the coastal belt. Trees of the same variety are frequently found in groups in the soils favourable to their development and then 6 or 8 per acre may be reckoned upon. The number of trees that can be worked now in Northern Menabe is estimated to be about 6000, which would yield for that region about 30 tons of oil seeds; by the European methods, these would produce about 1650 gallons of oil.

RUBBER,
M AND RESIN
PLANTS

257 - Tests of African Rubber.

BREUIL, PIERRE. Essais de caoutchouc d'Afrique. — *Le Caoutchouc et la Gutta Percha*, Year 10, No. 107, pp. 6884—6891. Paris, January 15. 1912.

This article gives the result of comparative tests of some samples of Funtumia rubber and the so-called "caoutchouc des herbes" (1) with Para Weak. As a test of the general value of rubbers, the writer took half the product of the tension strain resulting from the multiplication of this strain by the amount of elongation at the moment of rupture, He found that in Funtumia rubber vulcanised with 4.7 per cent. of sulphur, the pliability diminishes with the increase of the time of vulcanization, its "cyclic fatigue" increases (2), as do its resistance to rupture its stretching, and its permanent elongation. After being boiled for 90 minutes at 143° C. it is 1 ½ times more supple than Para, and becomes more elastic and a little less than twice less resistant than Para.

The "caoutchouc des herbes" becomes more supple, less cohesive and more extensible than Para rubber. It improves in quality with the length of the vulcanizing process.

The time of vulcanizing has little influence on the suppleness, extensibility and even on the resistance of Para; and the short fatigue cycle of the latter is only about 1/6 of that of the before mentioned varieties.

The increase of the sulphur (mixtures of 6.9 per cent.) used in the vulcanizing process causes the two African varieties of rubber to resemble Para closely. It raises the general value even of Para; Funtumia becomes worth 2/3 instead of 1/3 of the value of Para, while "caoutchouc des herbes" is worth 1/3.

The writer lays stress upon the arbitrary nature of the tests he has chosen for his determinations and upon the fact that the superiority in use of one rubber over another must not be deduced from his conclusions. The uses of Congo rubbers are different from those of Para; the former are preferred for the manufacture of certain articles on account of their softness. These experiments, on the other hand, show that it is necessary in the case of every kind of rubber to ascertain the optimum condition of vulcanization and, to this end, the conscientious investigator must make many experiments under varying conditions.

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(1) The name "caoutchouc des herbes" is given to rubber extracted from the rhizomes of *Carpodinus lanceolatus, Landolphia Henriquesiana Clitandra*, etc. (*Ed.*).

(2) The writer uses the term "cyclic fatigue" for the percentage elongation under a weight shown by samples of rubber after 5 cycles, or successive applications of equal tension. (*Ed.*).

258 - **Rubber in the Philippines.**

1. The Philippine Rubber Planting Industry.
2. ARTHUR, RICHARD. Rubber-Growing in the Philippines.
— *The India Rubber World*, Vol. XLVII, No. 3, pp. 139-141. New York, December 1, 1912.

1. — Government Commissioner of the Moro Province of the Philippine Islands estimates that the total area under rubber in the Philippines is about 6000 acres, of which about 3000 are in the province of Moro, 2500 in Mindoro and 500 in other provinces. On the other hand, the official estimate of the Director of Agriculture places the area in promising rubber trees (approaching the bearing state) at about 1250 acres. The bulk of the planting has been done since 1909. At first Hevea, Ceara (*Manihot Glaziovii*) and Castilloa were tried, but hundreds of thousands of Ceara seedlings have failed to grow owing to drought or other reasons. Only Parà rubber is now considered of value on the plantations and it is estimated that 90 per cent. of the acreage at present planted is in that variety. In most cases Ceara and Castilloa have been abandoned, owing to their inability to withstand droughts and strong winds and their variability in yield of latex.

The following figures of the cost of production have been estimated by the Moro Province Government.

	Cost of bringing into cultivation an acre of new land				Costs of upkeep per acre			
	$	£	*s*	*d*	$	£	*s*	*d*
Moro Province	50.94	10	9	3	18	3	14	0
Sumatra	73.60	15	2	5	20	4	2	2
Java	109.94	22	11	10	23	4	14	6
Malay States	—	—	—	—	29	5	19	2
Straits Settlements . . .	137.42	28	2	10	—	—	—	—

It is claimed that in the Moro Province an acre of Parà rubber can be brought into bearing (fifth year) for $100, covering all charges, including cost of land;

Rubber is usually planted from 100 to 150 trees per acre, Five-year-old rubber trees have averaged three-quarters of a pound per tree; this brings the cost per pound of dry rubber, ready for shipment, to 33 cents (1*s* 4*d*) per pound, which can be reduced, as the yield increases with age. Native labor is procurable at 20 to 30 cents (10*d* to 1*s* 3*d*) per day. Although Philippine rubber has up to the present only entered the American market on a very limited scale, it has been favorably received in Europe, particularly in Hamburg and London, where in May 1910 it realized $2.63 (10s 10d) per lb. and has ever since commanded the top price.

2. — Besides having published numerous technical articles on the rubber industry of the Philippines, the Bureau of Agriculture in the Philippines has arranged to distribute some 50 000 Parà seedlings; these young plants will be carefully watched by the Bureau until well established. It is believed that no fungus diseases have been introduced into

the Philippines along with the seeds, which were obtained from Malaya. Naarly all districts of the Philippines, with the exception of Mindanao and some of the southern islands, are subjected to a dry season, but the Bureau of Agriculture believes that in many otherwise unfavorable localities the soil about the roots of the young seedlings can be kept sufficiently cool by the new system of leguminous «blanket crops», thus preventing injurious packing and baking by the sun.

259 - The Vitality of Hevea Seeds.

WILDEMAN, E. DE. Vitalité des Graines de l'Hevea. — *Le Caoutchouc et la Guttapercha*, Year 9, No. 106, pp. 6776-6780. Paris, December 15, 1912.

After having given a summary of the experiments of Mr. F. G. Spring, Superintendent of the plantations of the Federated Malay States on the vitality and germinating property of Hevea seeds the writer makes the following observations.

According to Mr. Spring's experiments, of which the results are reproduced in the tables given later, it appears that 50 per cent. more of the seeds of untapped than of tapped Hevea trees germinate. It is an interesting fact that these experiments, while reversing the conclusions reached in 1908 in the *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon*, confirm the statement that the seeds of untapped trees are, on an average, 10.7 per cent. heavier than those of tapped trees of the same age.

To preserve the germinating property of Hevea seeds various methods of covering them have been used; Mr. Spring has made experiments as to their relative efficiency. The results show that the highest germination percentage is obtained by using either seeds from untapped Para rubber trees, or seeds from tapped trees, which have been envelopped in wax.

The writer of this article states that the necessity of knowing beforehand the value of the plants to be raised, and the need for regulating selection, are reasons for prefering the seed of tapped trees, while Mr. Spring's experiments show the value of covering the seeds with wax. This is, however, costly; but if the seeds have to be subjected to a journey, of over 45 days, the number of plants obtained from seeds thus treated will repary the expense incurred.

On the other hand, the experiments on the germinating property of seeds of tapped Hevea should be continued, to determine whether the germination percentage diminishes with the number of years tapping has been continued. Should this prove to be the case, which is probable, seed for sowing purposes should be selected from trees which have been seldom tapped, but yet often enough to afford some criterion of their economic value. Thus there remain to be made a number of experiments, whose results will be of great importance to the future of the plantations.

The following tables give the results of Mr. Spring's experiments:

I. *Germination percentage of seeds from tapped and untapped trees.*

	Number of seeds per box	Duration of experiment	Number of plants from seed from trees		Percentage of germinated Seeds of trees	
			tapped	untapped	tapped	untapped
1	200	3 weeks	67	156	33	78
2	200	5 »	46	133	23	66
3	200	7 »	48	100	24	50
4	200	8 »	40	167	20	83
5	200	9 »	40	164	20	82
6	200	10 »	40	165	20	82

II. *Germination percentage of seeds of tapped "Hevea" trees, untreated and enveloped in wax and in paraffin.*

	Number of seeds per box	Duration of experiment	Number of plants obtained		Germination percentage		
			Wax	paraffin	wax	paraffin	untreated
1	180	3 weeks	107	62	59	34	33
2	180	5 »	108	71	60	40	23
3	180	7 »	94	74	52	41	24
4	180	8 »	82	66	45	37	20
5	180	9 »	100	61	55	34	20
6	180	10 »	86	58	47	32	20

260 – Recent Studies on the Production of Natural Camphor.

BAILLAUD, E. Précisions nouvelles sur l'exploitation du camphrier. — *Journal d'Agriculture Tropicale*, Year 12, No. 138, pp. 362-367. Paris, December 31, 1912.

The writer had already mentioned in the *Journal d'Agriculture Tropicale* for June 30, 1912, the results obtained by growing the camphor tree in the United States and in South Africa; he now gives a short summary of the papers which have appeared more recently. The most important contribution is Mr. B. J. Eaton's study published as *Bulletin No. 15 of the Federated Malay States* in February 1912. This article contains an apparently complete bibliography of the works published on camphor (1), and a short review of the results obtained from camphor-growing in different part of the world.

The first experiments in the Malay States date from seven years back and, after five years, the trees were in as good condition as those of the same age in Japan.

According to Mr. Spring, the present Superintendent of the Experimental Plantations of the Malay States, the best method of propagating *Cinnamomum Camphora* is still by purchasing two-year-old plants from Japan, as experiments with seed and slips have proved unsatisfactory.

With regard to cutting, Mr. Eaton recommends beginning in the third year. An acre containing 700 three-year-old camphor trees gives annually in three cuttings 180 lbs. of camphor.

The distillation experiments have led to the following conclusions:

a) A yield of about 1 per cent. of camphor and of oil consisting chiefly of camphor can be obtained from the leaves and branches of trees of five years of age and perhaps younger.

b) The time of distillation ought not to exceed three hours in the case of the leaves of young branches.

c) The proportion of camphor obtained from the leaves is greater than that yielded by the branches, and the yield of the small shoots is more than that of the older branches of trees of the same age.

d) Drying in the open air has no bad effect upon the yield, but this would probably not be the case if the leaves were exposed to the direct rays of the tropical sun.

The camphor tree seems to grow well in the Malay States in relatively poor laterite soils, provided they are well drained. These results agree with those obtained in the United States, the Union of South Africa (2), and British East Africa; consequently it seems clear that the true camphor tree can be grown in all countries with a tropical or subtropical climate.

In Formosa also, the "Bureau des industries productives" is going to start regular plantations in 1913-1914; these should provide for an annual production of about 3000 tons of camphor and a like amount of oil. An improved apparatus has been installed, allowing of 48 per cent. by weight of camphor being obtained from the oil treated.

China appears about to take an important place in camphor production, since the Chinese traders now go into the interior as well as the valleys of the coast, and the export trade from the Northern ports is continually increasing.

But besides the camphor tree of Japan, other trees are used as sources of natural camphor. In the first place should be mentioned *Blumea bal-*

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(1) An important contribution to the bibliography of camphor is made by Prof. ITALO GIGLIOLI, in his work entitled *La canfora italiana*. Roma, 1908 (*Ed.*).

(2) Warner in the *South African Agricultural Journal* of January 1912. (*Ed.*).

samifera, recorded in Tonkin in 1897 by Mr. Morice, and called by the Annamites "dai-bi". According to M. Lan, 400 lbs. of leaves produce 1 lb. of "bang-phien", which is the camphor-like substance obtained.

In Burma, it is cultivated for local consumption, but the Forestry Service, while demonstrating that *Cinnamomum Camphora* can be grown in that country with success, is also making preparations for the cultivation of *Blumea balsamifera*.

Some researches have been made on *Dryobalanops Camphora*; this tree supplies borneol, of which the neighbourhood of Sumatra furnishes about 220 lbs. annually; it has been ascertained that the Borneo camphor is only formed in the crevices formed in *Dryobalanops* by a beetle grub which has not yet been determined.

The linalool, obtained from a species of camphor tree called "shu-sho-bohu", can also be extracted from real camphor oil.

Rosemary is also mentioned as a plant which may assist in the production of true camphor, as its oil gives 8 to 10 per cent. of a mixture of camphor and borneol; from the preponderance of the former it could be used directly without recourse to chemical transformation. Laboratory experiments appear also to have been started in certain large French factories.

261 - Experiments on Manuring Tobacco in Hungary.

VARIOUS CROPS

KERPELY, KÁLMÁN. Dohánytrágyázási kisérletek. — *Dohány Njsdg*, Year XXX, No. 2, pp. 2-4. Budapest, January 20, 1913.

Experiments begun in 1897 by the writer, Director of the Royal Hungarian Experiment Station for Tobacco Cultivation at Debreczen, in 8 plots of sandy soil to which from this date no manure was applied for 13 successive years, in order that the effect of the manures subsequently spread on the exhausted soil might be studied.

The yield of the tobacco grown during this time diminished in quantity and deteriorated more and more every year. While during the first few years the crop of "Szeged" varied from 1850 lbs. to 2 000 lbs. per acre, in 1909 it was only 960 lbs. The analysis of the soil showed that, during these 13 years, the loss of nitrogen and lime had been greater than that of potash or phosphates.

Finally in 1910, the application of chemical manures began. Owing to the special nature of the experiments, a larger quantity of manure than usual was used per acre, *viz.* 390 lbs. of 18 per cent. superphosphate, the same amount of 40 per cent. potash and 530 lbs. of nitrate of soda; the two first were applied at the beginning of February and the last in two parts, after the first and the second hoeing. When, as in 1910, the rainfall is abundant, a satisfactory result can be confidently expected.

The following table gives the distribution of the various manures, the yields, and the combustibility of the tobacco before and after fermentation.

Plots	Manures	Amount of manure per acre	Yield per acre	Excess over control	Combustibility of leaves per second	
					Before fermentation	After fermentation
		lbs.	lbs.	lbs.	seconds	seconds
1	Control (no manure for the 13 preceding years)	—	998	—	23	31
2	Farmyard manure	46 350	1485	487	18	23
3	18 % superphosphate	390	1044	46	21	36
4	40 % potash salts	390	1176	178	29	42
5	Nitrate of soda	530	1632	634	16	27
6	18 % superphosphate 40 % potash salts	390 390	1300	302	32	48
7	18 % superphosphate 40 % potash salts Nitrate of soda	390 390 530	1795	797	22	34
8	18 % superphosphate 40 % potash salts Nitrate of soda Lime from sugar factories	390 390 530 15 400	2110	1112	21	29

The conclusions reached are :

The tobacco grown on the control plot showed a very feeble condition of development; its thin light-green leaves, 8 on a stem, manifested the characteristic signs of want of nitrogen. It was deficiency in nitrogen that had reduced the yield ; this was clearly seen from the plants which hed been given nitrate of soda, whose much larger, thick dark green leaves, 12 on the stem, developed normally, while superphosphate and potash, whether used together or separately, had only a secondary effect on increasing the crop. In fact, the excess of plot 6 over the control was 302 lbs., while that of plot 7 was 797 lbs. The fertilizing effect of the lime used with the superphosphate, potash and nitrate (plot 8) should also be noticed ; this was shown by a yield superior to that obtained from any other plot. This effect is explained by the impoverishment of the experiment soil during the period of 13 years, when the lime content decreased from 0.207 per cent. to 0.112 per cent.

It was further shown that, thanks to the application of nitrate, a more valuable and resistant substance was obtained, and though the combustibility of the leaves was less than when other manures were employed, yet a fine ash was obtained.

The Experimental Station will continue its experiments; every three years a mixture of farmyard manure and lime will be applied, other manures being added every year, with the view of observing the effects due to the application of an excessive amount of manures during a prolonged period of time.

262 - The Anatomy of "Jequirity" (Seed of *Abrus precatorius*) and of the Seeds commonly used as Adulterants.

BARIOLA, ROSA. Sull'anatomia del "Jequirity" (seme dell'*Abrus precatorius*) e dei semi delle piante comunemente usate per sofisticarlo. — *Atti della Reale Accademia dei Lincei*, Year CCCIX, Series V, Rendiconti, Vol. XXI, Part 12, pp. 859-863. Rome, December 15, 1912.

This is an anatomical and microchemical study of the seeds and medicinal powders of *Abrus precatorius* L. and of those of other Leguminosae with which they may be confused or fraudulently mixed, namely the seeds of *Rhynchosia precatoria* or *phaseoloides* D. C.; of *Adenanthera pavonina* L.; and of *Ormosia dasycarpa* Jacks.

263 - The Naples Tomato.

MARKET GARDENING

ZACHAREWICZ, ED. La Tomate de Naples. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 997, pp. 117-119. Paris, January 23, 1913

The variety known as the "Naples Tomato" is much cultivated in the neighbourhood of the city of Naples. The fruit is exported in large quantities to the German markets, where it is much prized for its size, rounded shape, smooth skin, colour, fragrance, and firmness. The plants are strong, productive and disease-resistant.

The writer made experiments in two market gardens in the neighbourhood of Avignon (Vaucluse) where the soil is formed of the recent alluvium of the Durance, and is a marl rich in nitrogen and phosphoric acid and containing a fair amount of potash. The "second early" system of cultivation was adopted, as is usual in the district; that is to say the plants are forced half the time in frames and then planted out. The amount of manure used per acre wes as follows: farmyard manure, 14 tons; sulphate of ammonia, 180 lbs; sulphate of potash, 180 lbs.; 18 per cent. superphosphate, 360 lbs. Two applications of soap mixture and two of Bordeaux mixture were made.

It was shown that the Naples variety possesses all the above-mentioned qualities; and it is so suitable for export that it fetches 10*d* per cwt. more than the other tomatoes on the market.

Further, Naples tomatoes are more productive than the local varieties (18, 20 and 22 lbs. per plant in each of the two market gardens, as against 13 to 15 ½ lbs. for the Rochefort variety).

The writer therefore recommends the cultivation of the Naples variety, which will find a ready sale in a district where the exports of fruit increase every year.

264 - The Kerguelen Cabbage.

POISSON, H. Le Chou de Kerguelen. — *Revue Horticole*, Year 85, No. 1, pp. 14-15. Paris, January 1, 1913.

The Kerguelen cabbage (*Pringlea antiscorbutica*, R. Br.) is a native of Kerguelen and the adjacent islets. It has a stalk 28 inches high and its root is 6 inches in length. At the top of the stalk is found the cabbage-head; this is composed of green leaves with well developed central veins and secondary veins similar to those of European cabbage; the outer leaves droop; the succeeding ones, which are yellowed, and inside white, form a compact "ox-heart" 10 in. high and 12 in. broad. Around the head and on the stalk grow the floral spikes, which are 3 ft. high, the flower-bearing portion reaching a height of 16 in. and bearing 100 to 150 flowers. The fruit is a siliqua about 2 in. long by half an inch broad. The seed, which is white and irregularly triangular, is 4 mm. long and from 2 to 3 wide at the base.

Pringlea antiscorbutica is a valuable plant in cold countries, being used, like many other Cruciferae, as a preventive of scurvy. Further, it is an article of food; the heart can be eaten raw or made into salad, and the pith of the stem is edible, its taste much resembling horse-radish.

Finally, the seed is eaten raw and tastes like hemp-seed or maize-flour; as each inflorescence bears 100 to 150 flowers and there are about 50 seeds to a fruit, this makes from 5000 to 7500 seeds on an inflorescence.

This plant requires, when cultivated, a rather light and ferruginous soil, such as results from the decomposition of basalts; it must also contain some salt. It seems worth while acclimatizing this cabbage in the cold countries of the north, where it would be a great resource for the inhabitants and their domestic animals. But even if it could be grown in temperate zones, *Pringlea antiscorbutica* would there chiefly serve as an object of curiosity.

265 - A Substitute for Flower-pots: Tubes of Giant Reed (*Arundo Donax*).

PÉREZ, GEORGES V. Pour remplacer les pots : Tubes de roseau de Provence (*Arundo Donax*). — *Journal de la Société Nationale d'Horticulture de France*, Year IV, Vol. XIII, pp. 717-718. Paris, November 1912.

For a long time past, in Australia and at the Cape of Good Hope, tubes formed by pieces of stalk of the giant reed (*Arundo Donax*) have been used for large plantations of various kinds of acacias as well as for the multiplication of Eucalyptus. These tubes occupy less space and are less fragile than the usual flower-pots; they allow hundreds of plants to be kept for months while waiting for the favourable moment for planting out. They offer also great advantages for transport over long distances and for reafforesting dry soils.

The writer has employed this system to advantage for the last dozen years; he has thus been able to obtain in two months rooted cuttings of *Atriplex nummularia* by introducing into the tubes herbaceous cuttings instead of seeds. In order to use these cuttings the only thing to be done is to make a hole in the ground and place a tube containing a plant into it.

The writer has no doubt that in desert, sandy and even salt soils, wonders may be achieved with this system in the production of valuable pastures.

266 - **Manures for Vines.**

FRUIT-GROWING

LABERGERIE. Fertilisants pour la vigne. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 995, pp. 33-36. Paris, January 9, 1913.

Experiments with different manures were made in 1912 in the vineyards of Fontliasmes and they will be repeated for three consecutive years. All the manures were spread before the first spring ploughing.

The soils of the Fontliasmes vineyards are remarkable for their deficiency in lime. Many analyses of the different plots of ground have been made, and the figures obtained have in every case been very similar to the averages given below. The only factor which varies appreciably is the compactness of the soil, depending on its clay content. Fine soil, 76.40 per cent.; calcareous stones, none; siliceous stones, 23.60 per cent. In every 100 parts of fine soil there are : sand, 92-80 ; clay, 5-17; lime, traces ; humus, 0.20 ; nitrogen, 0.14 ; phosphoric acid, 0.05 ; potash, 0.096 ; lime, 0.20 ; magnesia, 0.30 ; water and substances soluble in acidulated water, 2.014.

Weight per acre, calculated on 0.14 (*one-seventh*) *acre.*
Experiment with sulphate of potash at 2.4 *cwt. per acre.*

Plots and their situation; nature of the soil		Number of bunches	Weight of bunches		Yield of must	
			average	total	%	Total
			lbs.	lbs.		gallons
I: west part; a little injured by hail. Loam, fairly compact, cold.	without potash	28 700	0.238	6 840	63	427
	with potash	36 300	0.251	9 132	66	601
I: east part; untouched by hail. Loam, stony, dry, warm.	without potash	33 200	0.222	7 478	60	441
	with potash	26 700	0.255	6 830	68	463
II: all slightly hurt by hail; west part. Loam, very compact, cold.	without potash	30 750	0.198	6 191	55	338
	with potash	31 600	0.209	6 610	57	374
II: east part. Loam, compact, cold.	without potash	32 000	0.220	7 048	60	422
	with potash	32 000	0.242	7 761	64	494

Experiments with manures containing manganese.

Plots and their situation; nature of the soil;	manures used	Number of bunches	Weight of bunches		Yield of must	
			Average	Total	%	Total
			lbs.	lbs.		gallons
Manganese at 1.6 cwt. per acre.						
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without manganese	25 700	0.211	5440	57	312
	With manganese	31 850	0.220	7020	60	418
I: east part; untouched by hail. Loam, stony, dry, warm.	Without manganese.	33 200	0.273	9070	72	650
	With manganese	30 750	0.284	8830	74	650
Lime and manganese at 1.6 cwt. per acre.						
II: all slightly injured by hail; west part. Loam, very compact, cold.	Without lime and manganese	27 500	0.202	5575	56	312
	With lime and manganese. .	29 950	0.220	6600	60	392
II: east part. Loam, compact, cold.	Without lime and manganese	30 350	0.216	6560	59	387
	With lime and manganese. .	31 600	0.231	7315	62	454
Sulphate of manganese at 0.4 cwt. per acre.						
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without sulphate of manganese	27 700	0.233	6470	62	401
	With sulphate of manganese.	28 700	0.246	7090	65	463
I: east part; untouched by hail. Loam, stony, dry, warm.	Without sulphate of manganese	28 100	0.288	8110	75	605
	With sulphate of manganese.	30 550	0.290	8885	76	677

Each experimental plot consisted of 50 ares (1.23 acre) selected in the middle of a hectare (2.47 acres) in such a manner as to leave a control portion at either end, which was unmanured. The vine used was without exception the Folle Blanche des Charentes.

The results of numerous previous experiments had shown that the yield in must increased with the weight of the grapes. In a good season, when the fruit ripens normally, the average weight of the bunch of grapes in Fontliasmes vineyards for Folle Blanche is 125 gr. and the must yield is from 73 to 75 per cent. The above tables have been drawn up according to the weights obtained every year from 1901 to 1908. The figures must not be taken absolutely, for they depend to some extent upon the degree of ripeness of the fruit. When the average weight of a bunch of Folle Blanche grapes is 135 gr., the average must yield (weight) will be 77 per cent.; for 130 gr., 75 per cent.; 125 gr., 73 per cent.; 120 gr., 70 per cent; 115 gr., 67 per cent.; 110 gr., 64 per cent.; 100 gr., 60 per cent.; 95 gr., 57 per cent.; 90 gr., 55 per cent.

In each plot 6 ares (0.14 acre) at each end, *i. e.* 12 ares in all, were the subject of comparative verification with adjoining areas of the same size on the control plot; the bunches gathered from all this area were counted and weighed; the average bunch-weight and the must yield were ascertained.

The sugar content of the juice from each plot was tested by means of a mustometer, but the data are inaccurate owing to the very bad weather which prevailed during the vintage of the plots used for verification of the results.

From certain observations due to cultural accidents, the above figures were furnished by the verifications.

The influence of electricity. — Experiments in obtaining electricity from the atmosphere have been attempted, using metal rods, to test the action of the current. Iron rods ¼ in. in diameter and provided with a rounded end of copper attached by screws were employed. The rods, which varied in height, ware spaced at double the distance of their height above the ground, and kept in a vertical position by supports of wood. They were inserted in the soil to a depth of about 6 in. and a length of 20 to 24 in. was placed horizontally below the ground. The results for the short rods (6 ft. 6 in.) and the long rods (11 ft. 6 in.) were exactly of the same nature.

They are given in the following table:

Plots and their situation; nature of the soil		Number of bunches	Weight of bunches		Yield of must	
			average	Total	%	Total
			lbs.	lbs.		gallons
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without rods	9 950	0.284	2 830	74	205
	With rods	13 300	0.246	3 277	65	214
I: east part; untouched by hail. Loam, stony, dry, warm.	Without rods	15 600	0.220	3 435	60	205
	With rods	14 300	0.240	3 479	63	214

The following figures are the averages of those given above (rounded off):

Experiments with sulphate of potash.					
With	31 650	0.240	7 580	64	480
Without	31 150	0.220	6 870	60	410
Experiments with carbonate of manganese.					
With	31 100	0.240	7 440	64	543
Without	29 200	0.224	6 660	61	414
Experiments with sulphate of manganese.					
With	29 650	0.268	7 990	70	570
Without	27 900	0.260	7 290	68	499
Experiments with atmospheric electricity.					
With conducting rods	13 800	0.264	3 350	64	214
Without conducting rods	12 750	0.253	3 130	67	205

The potash manures gave an increase in the net return of about 15 per cent. and the manures containing manganese an increase of about 13 per cent.; the chief action in the latter case is attributable to the lime and manganese, which seems quite natural, given the small amount of lime present in the soils experimented upon. The differences in the total weight of the yields are as a rule unimportant, but what is constant (except in the case of a plot furnished with metal rods) and remarkable, is the increase in the average weight of the bunch under the influence of the different manures used, and also as a result the increase in the must yields.

267 - The Cultivation of Mulberry Trees in Madagascar.

FAUCHÈRE. La culture du Mûrier au Madagascar. — *Bulletin Economique du Madagascar*, Year XII, No. 2, pp. 19-38. Tananarive, 2nd Half - year, 1912.

It is well known now that all the forms of mulberries that are met with in the Madagascar plantations belong to the species *Morus alba* and it is probable that it is the same white mulberry that forms all the mulberry groves of Asia. But the mulberry is a tree extremely subject to variations and in the Madagascar plantations alone there are at least 20 or 30 forms of a mulberry called Malagasy or native mulberry. They are far from having all the same value, and it is indispensable to multiply only the most vigorous and productive kinds, all the more so as those which produce the most abundant and most developed leaves are also those least subject to the disease known as "leaf mildew". Besides the native mulberry, which Prof. Cornu considered as a variety *indica* of *M. alba*, other varieties have been introduced since the French occupation, among others the Philippine mulberry or *multicaulis*, which has succeeded perfectly in the Madagascar plantations, and which has the advantage of being very early and of producing leaves very soon.

A subvariety of this mulberry, the Lou mulberry, seems to suit more especially the high parts of Vakinankaratra where frosts are to be feared during the first fortnight of September, as it is a very late form, the leaves not beginning to appear till the end of that month. Another variety that it would be advantageous to import is the Tonking mulberry, which, grown as shrub, would give leaves almost throughout the year.

Climate. — The mulberry finds in the whole island a suitable climate, and while it is true that in the parts situated above 4500 feet the September frosts cause serious damage to the trees, yet they never endanger their life. On the west coast mulberries thrive very well, as well as at Diego Suarez, Tamatave and Fort Dauphin. The east winds retard the vegetation, so that if early leaves are required the trees must be protected against the wind.

Soil. — The deep and moist alluvial soils along the river courses in Madagascar, as well as the volcanic soils, suit the mulberry admirably; while compact and swampy soils in which moisture stagnates are unfavourable; nevertheless in very moist soils mulberries grow very well after efficient drainage.

Multiplication. — The multiplication by cuttings is extremely easy in a warm moist climate like that of certain districts of Madagascar. In tropical countries therefore cuttings of either herbaceous or lignified branches may be used.

For cuttings of lignified branches, one-year-old branches about a finger thick are adopted. The soundest and best developed ones are selected and either planted at once where the tree is to grow or put into a nursery; the latter method is preferable for the centre of Madagascar, where long periods of drought prevail. For this reason the best moment to stock the nursery is between July 15 and August 15, a time that corresponds to spring in Europe.

The best time for multiplication by herbaceous cuttings is the rainy season between the end of December and the first fortnight of February; the herbaceous extremities of healthy branches are taken from the most vigorous mulberries and they are planted directly where the tree is to stand; it is useful also to mulch the soil with grasses after planting the cuttings. On the east coast and in the forest regions all the precautions which are needed in the centre and on the western slope are almost unnecessary, and multiplication by cuttings can be done easily at any time of the year.

It is not advisable to waste time in multiplying mulberries by means of seed; as for grafting, it does not present any difficulty. Cleft grafting is practised at the moment when vegetation reawakens, that is, for the centre of Madagascar, at the end of July and the beginning of August. Crown grafting is performed during the course of vegetation, from October to March in the centre of Madagascar, and no doubt in the whole southern hemisphere.

The best time for shield-grafting mulberries is from September 15 to March 15; but it is not impossible that on the east coast shield and crown grafting may be carried out during the whole year, as the mulberries are in continuous vegetation.

Selection of the site of a mulberry plantation. — The natural conditions of the island do not always allow of an easy choice of the soils having all the desired requisites, and one must often put up with medium soils; still, if plenty of manure is available, the mulberries may be planted anywhere. At the Namisana Station mulberry groves have been planted in very dry soils consisting of extremely poor laterite and the trees behave very well; it is true that the plantations have been very carefully prepared and their soils vastly improved with the refuse from Antananarivo.

Preparation of the soil and planting. — Breaking up the soil and digging the holes for planting must be done during the rainy season or during the two following months, because when the soil is dry these works cost twice as much. In rice-fields or in alluvial soil, breaking up the soil does not appear to be necessary, as these soils are generally sufficiently loose. In the centre of Madagascar planting out must be done during the rainy season; it presents no difficulty. If a plantation is made during the dry season, resort must be had to irrigation or at least to abundant watering after planting.

Distance between the trees and shapes to be given to the trees. — The distance to be kept between the trees varies considerably, according to the kind of cultivation adopted and to the fertility of the soil.

Mulberries may be grown as hedges, dwarfs, half-standards and standards. As hedges they produce leaf very soon, especially in warm and moist climates; the drawback is that the hedges require a great number of plants or of cuttings. The writer advises the silk growers of Madagascar to grow dwarfs and half-standards not above 3 or 4 ft. high. In plantations such trees must be placed at about 10 ft. from each other.

The trees are preferably shaped in the nursery; half-standards require about three years, while dwarfs form their stems in one year.

Upkeep. — The successive cultivation of mulberries consists of hoeing once or twice a year, manuring, pruning and the control of insects.

In the centre of Madagascar it is generally sufficient to hoe twice a year; green manures such as pigeon pea and Réunion mimosa are recommended, as they introduce into the soil a certain amount of moisture besides plant food. Pruning presents no difficulties in tropical countries; it is indispensable every year for the hedges, and consists in cutting back the branches of the year to 4 or 6 inches from the soil.

Duration and yield of mulberry plantations. — It is not yet known up to what age mulberry trees produce satisfactory leaf crops, but judging from the specimens which grow freely near certain villages in the centre of Madagascar it is reasonable to suppose that they will continue to produce leaves for several decades. Grown as hedges it is generally necessary to replace them after five or six years.

The leaves may be gathered, according to the writer, twice a year from the same tree under the climate of Antananarivo; three crops might be obtained where the soil is very fertile, and on the east coast it would be possible to have four or even five crops without endangering the existence of the trees.

As for the returns, no exact figures are available; nevertheless the results obtained at Nanisana warrant the belief that a plantation of mulberries grown as hedges under the best conditions yields in two crops 64 to 80 cwt. of leaves per acre.

Pests. — The insect which causes most damage to mulberries in Madagascar is a kind of scale, doubtless related to *Diaspis pentagona,* and controlled in the same way as this. Other pests of mulberries are : *Callimatium venustum,* a longicorn about $^4/_5$ of an inch long ; the " fanetribe ", a large bug : and the " fovato ", a weevil known as *Alcides excavatus.* The only injurious fungus is a leaf-mildew, named by M. Delacroix *Ovulariopsis moricola,* which is controlled by selecting the large-leaved varieties and by keeping the soil of the plantations in a good state of fertility.

268 - **Production of a New Variety of Cherry by Shield-Budding.**

PAELINCK, F. in *La Tribune Horticole* quoted by BOIS, D. and GRIGNAN, G. T.: L'influence du sujet sur le greffon. — *Revue Horticole,* Year 85, No. 2, pp. 27-28. Paris, January 16, 1913.

About ten years ago, at Swynaerde, near Ghent, an Early Rivers cherry was shield-budded on a Mahaleb stock near the base. The operation was performed in August, and proved quite successful, the stock being cut back the following spring. After four years the first crop of fruit was obtained, and the cherries borne by the new tree were of a yellowish-white colour instead of dark red like those of the parent tree, the crop moreover being a week later in ripening. A shoot of this new variety was then grafted on to a wild cherry (*Prunus avium*) in order to see whether it would revert to its original condition ; however, the fruit on the fresh stock retained the characters of the new variety, *i. e.* loss of colour and of early maturity.

269 - **Citrus Growing in Rhodesia.**

The Rhodesia Agricultural Journal, Vol. X, No. 2, pp. 216-220. Salisbury, Rhodesia, December 1912.

The Mazoe Citrus Syndicate was formed in 1909 and is now farming 9000 acres near the junction of the Tatagura and Mazoe Rivers. Theirs is the first organised effort to grow citrus fruits on approved lines in Rhodesia, and there is every reason to believe that the country is eminently adapted to the culture ; the fact that the fruit ripens there during the dry season, and can therefore be put on the home market at a season when there is little competition from other sources, is a great advantage.

A grove of 1000 trees of the Washington Navel Orange, budded about 4 in. from the ground on the native wild lemon stock, was planted in February 1910, the buds being then two years old. A second thousand were planted in December 1911, the buds being then one year old. The average measurements of these trees at present are :

	Height ft. in.	Circumference of spread of top ft. in.	Circumference of stock at union in.
Planted in 1910	6 1	2 7	6½
" " 1911	4 0	6 6	4½

Another grove, of 2 000 Navel trees, 28 Satsumas, 58 Valentias, and 10 lemons, was planted three years ago on high rocky ground and is also doing very well. There is a large nursery stock, all on the native wild lemon and a further 3 000 trees are to be planted out during the present wet season.

The slight frosts encountered have not injured the trees, but are likely to be beneficial to the fruit by sweetening it and improving the quality. So far no fertilizers or manure have been employed, neither has irrigation been practised ; but as it is desirable to make provision for the application of water in exceptionally dry seasons, or even in ordinary dry seasons if yield and quality are thereby improved, the Syndicate is now engaged on an irrigation scheme which will probably be operating next dry season.

270 - Cacao Manuring Experiments in Dominica.

TEMPANY, H. A. in *Report on the Agricultural Department, Dominica* 1911-12, pp. 20-29. Barbados, 1912.

In 1900, an acre and a half of a 10-year-old cacao plantation was laid out at the Botanic Station and divided into five plots, each of which has received a different manurial treatment applied annually from 1902 to 1912. The following are the average returns for the period :

Number of Plot	Manurial Treatment: cwt. per acre	Wet cacao: lbs. per acre	Dry cacao: * lbs. per acre	Cost of manuring: per acre			Net gain ** by manuring per acre		
				£	s.	d.	£	s.	d.
1	No manure	2800	1176	—			—		
2	Basic phosphate . . . . 4. Sulphate of potash . . . . 1 ½.	3369	1415	2	5	3	3	14	3
3	Dried blood . . . . 4.	3261	1370	1	16	0	3	1	0
4	Basic posphate . . . . 4. Sulphate of potash . . . . 1 ½. Dried blood . . . . 4.	3876	1628	4	1	3	7	4	9
5	Mulched with grass and leaves. .	4233	1778	3	0	0	12	1	0

* Calculated from the wet yield assuming 42 lbs. of cured cacao = 100 lbs. wet cacao.
** Taking the value of cured cacao at 6*d*. per lb.

The artificial manures are distributed over the surface of the ground and lightly raked in. The mulch consists chiefly of grass from lawns, and leaves and pods of the saman tree (*Pithecolobium Saman*), and is applied at the rate of 4 baskets of 20 lbs. each to every tree. No forking has been performed since the begining of the experiments.

The returns of the mulched plot have been uniformly highest, Plot 4 coming next in order, and in both these cases, the level of the yields was gradually increased during the first 5 or 6 years and then remained more or less stationary, fluctuating with the seasons. In the case of Plots 2 and 3, which receive incomplete dressings, and of Plot 1, with no manure, there has been no accumulation of fertility; but neither have the yields declined, though that may be expected to occur in future. The superiority of the treatment on Plot 5 is substantiated by the excellent appearance of the trees.

Two other experiments carried on at the Botanic Station during the years 1907-12 indicate: 1) that mulching is equally efficacious on a steeply sloping hillside and on the flat, and 2) that a mulch of grass and leaves is superior to an application of 600 lbs. per acre of cottonseed meal.

271 - New Experiments on the Cultivation of Walnut Trees.

FORESTRY

1. REBMANN. Neuere Erfahrungen über die Anzucht einiger Juglandeen. — *Allgemeine Forst- und Jagd-Zeitung*, Year 88, pp. 257-272 + 1 fig. Frankfurt a. M., August 1912.
2. ID. Nachtrag zum Artikel "über Juglandeen" im August-Heft 1912. — *Ibid.*, pp. 401-403. December, 1912.
3. BRANDSTETTER, J. v. Zur Kultur von Juglans nigra. — *Oesterreichische Forst- und Jagd-Zeitung*, Year 31, No. 2, pp. 10-11. Vienna, January 10, 1913.
4. BEEVOR, Sir H. R. Oak and Black Walnut Plantation. — *Quarterly Journal of Forestry*, Vol. VII, No. 1, pp. 28-29. London, January 1913.
5. SOMERVILLE, W. Raising Black Walnuts. — *Ibid.*, pp. 32-33 + 1 fig.

There is no doubt that the walnuts *Juglans regia, J. nigra* and *J. cinerea* rank among the most valuable kinds of trees. But, notwithstanding the wide limits of the area on which they live, their numbers are diminishing in both Europe and North America, in consequence of the great demand for them not being made up for by their reproduction. Lately measures have been taken and experiments commenced in various countries in order to promote the cultivation of these precious trees, especially *J. regia* and *J. nigra*: in Austria-Hungary about 1890, in Prussia in 1903, and in Hesse, Baden and Bavaria; also in Switzerland and, as it appears, in England.

As basis to be adopted for the cultivation of the above walnuts the limits for *J. regia* may be considered to be between 44° and 52° N. and for *J. nigra* and *J. cinerea* still further north, as they are killed by frost only at - 37° C. (- 34° F).

As for the soil suitable for walnuts, there is no agreement among the several writers and practical men. According to some, especially for *J. regia*, a calcareous soil is considered necessary, whilst others do not share this opinion. The writer has made an enquiry which yielded the following interesting results. For a tree about 60 years old standing by itself the following diameter breast-high may be reckoned upon:

	Inches
Sandy soil	15 ½ to 17
Schist soil	19 ½ to 21 ½
Good sandy alluvial soil	21 ½ to 23 ½
Rock soil *in situ*	23 ½ to 25 ½
Calcareous soil, loam and loess	25 ½ to 27 ½

Anyhow, the finest development is met with on deep calcareous or loess soils; so that it is believed that it is not so much the chemical composition of the soil as its physical properties such as depth, moisture, heat and aspect that have a special influence.

The most favourable localities are on hills, on the slopes of mountains and in spacious valleys. And what is said of *J. regia* holds good for the other two species, *J. nigra* and *J. cinerea*, with the difference that the two latter are much more exacting as to depth, looseness and moisture, and perhaps also as to the content in mineral substances.

The writer is of opinion that direct sowing is absolutely to be preferred to planting, provided that germination has taken place by the end of May. With this object he proposes the following method of sowing: the completely ripe fruit must be freed from its husk and dried so as to prevent the formation of moulds, after which the nuts of *J. nigra* and *cinerea* are placed in the ground in November at a depth of 2 ¼ to 2 ¾ inches, and at the rate of 6 or 7 thousand nuts on a few square yards. If cold is to be expected the soil should be covered with litter. The fruit of J. *regia* on the contrary is preserved in a dry place in sand or ashes and put into the ground in March. In order to facilitate germination, as the season opens, the ground may be covered with stable manure. As soon as the nuts have germinated and the shoots are 2 to 2 ½ inches long they are collected and planted in moist places. As for plantation, the best method would be planting them alone in clumps, at intervals of 5 feet or in belts with spaces of 4 ft. 7 in. × 4 ft. or 3 ft. 7 in., or 4 ft. × 3 ft. 7 in. or 3 ft. 3 in. In plantations under covert the development is less rapid but more regular. On the mode of development the writer gives the following instructive tables.

I. *Height of plants in feet and inches:*

a) *in the open*

Species	1st.	5th.	7th.	10th.	15th year
J. nigra .	1 ft. 4 in.	8 ft. 8 in.	13 ft. 1 in.	19 ft. 4 in.	28 ft. 4 in.
J. regia .	10 in.	6 ft. 0 in.	9 ft. 3 in.	14 ft. 11 in.	23 ft. 11 in
J. cinerea.	7 in.	4 ft. 1 in.	8 ft. 4 in.	—	—

b) *under covert*

J. nigra	8 ½ in.	3 ft. 11 in.	5 ft. 8 in.
J. regia	8 in.	4 ft. 5 in.	7 ft. 0 in.
J. cinerea	3 in.	1 ft. 10 in.	4 ft. 1 in.

II. *Development at 76 to 79 years.*

Isolated, full crowned.	Diameter	25 to 36 inches; average 28.7 inches. 263.4 cub. feet of wood.
At a distance of ¾ crown from each other.	Diameter	22 to 31 inches; average 24.7 inches. 177.6 cub. feet of wood.
Dense, ½ crown.	Diameter	17 to 23 inches; average 20 inches. 99.5 cub. feet of wood.
Crowded, ¼ crown.	Diameter	11 in. to 18.9 in.; average 14.9 in. 43.78 cub. ft. of wood.

Among subsequent operations hoeing is recommended, especially for isolated trees, and pruning both the lateral and frost-killed twigs, as well as the main ones when it is desired to limit the development in height.

In the management of walnuts it must be borne in mind that they behave very like oak trees respecting light and that consequently they require similar treatment and especially a thinning out at the age of twenty years.

Besides the production of walnuts by *J. regia*, which may be set down at an average of 2000 per tree in the full years, there is the production of wood. *J. nigra* may be estimated to yield at 80 years a final product corresponding to the normal product of oak trees of twice that age, namely 7945 cub. ft. per acre on first class soils; the production of *J. regia* and *J. cinerea* is somewhat less.

The writer gives the following values per cubic foot in south Germany:

		s	d
for logs measuring	47 to 57 inches in circumference	1	9½
,, ,,	59 to 69 ,, ,,	2	4¼
,, ,,	70 to 82 ,, ,,	2	11
,, ,,	82 in. and above	3	4

The writer admits the possibility of natural regeneration of *J. regia*, whilst it seems doubtful in the case of *J. nigra* and *J. cinerea*.

The following is a comparison between the cost of cultivation per acre of these walnuts and of oak.

Expenses on 126 *acres under walnuts.*

	£	s	d
1. Work of planting	277	8	9
2. 8272 lbs. of nuts	90	12	0
3. Production of 56 500 one-year old seedlings	10	15	7
4. Interculture, I and II year	95	1	2
5. Surveillance	26	14	0
Total	£500	11	6
per acre	£3 19s. 5½*d*.		

These calculations hold good for the period 1891-1910 and for Alsace. In general and under present conditions the outlay per acre and for 2630 plants of *J. nigra* and *J. cinerea* may be set down approximately as follows:

	£	s	d
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 2910 nuts		15	1
3. Sowing 3 ft. 8 in. apart		17	10
4. Weeding	1	3	7
Total	£6	19	10

The above outlay is reduced by about 6 shillings for *J. regia* owing to the lesser cost of the seed nuts.

The expenses for an acre under oak and for 2430 plants are about the following:

a) *Sowing.*

	£	s	d
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 16 ½ bushels of acorns		19	10
3. Sowing		17	10
4. Weeding		11	10
5. Surveillance	3	4	8
Total	£9	17	6

b) *Planting.*

	£	s	d
1. Preparation of the soil and planting out	5	7	1
2. 2430 oak saplings 5 to 6 years old	1	8	8
3. Cultivation and surveillance	1	3	10
Total	£7	19	7

The writer notes lastly that in order to judge surely the full forestal and financial bearing of a method of culture for a given kind of forest tree, about 30 years of experience are required.

3. — The above data agree in their general lines with the following practical rules, the result of many years' practice in a forest estate of Slavonia:

I. The soil should be a deep, somewhat clayey loam or moist alluvial soil containing humus.

II. The walnuts should be sown if possible with their husks and not deeper than 3 ¼ inches.

III. For planting, seedlings one or two years old at most to be used and their tap root cut cleanly at 12 inches.

IV. Mixing with other kinds of trees suitable to favour development in height and clean stems.

V. Hoeing and weeding.

VI. Pruning for the proper formation of the crown and when the tree is 16 to 20 ft. high.

VII. Protecting the plants from excessive shading, which hinders their normal development.

VIII. In game preserves, protection against damage caused by animals.

IX. Thinning out in due time to favour a normal formation of the crown, the increment of wood and the independence of the trees

4 and 5 — From the two English experiments quoted the following considerations are drawn:

I. The greater productivity of *J. nigra* in comparison with oak (14 walnuts have the same volume as 20 oak trees in the same stand 80 years old).

II. It appears that the American seed of *J. nigra* is much superior to the English seed, both for its power of germination and for the vigour of the seedlings.

272 - Twenty-five Years of Reafforestation in the Karst in Carniola.

RUBBIA, K. Fünfundzwanzig Jahre Karstaufforstung in Krain. — *Bericht der Aufforstungs-Kommission für das Karstgebiet des Herzogtums Krain über die Tätigkeit vom Jahre 1886 bis Ende* 1911, pp. 97 + figs 2. Lubiana, 1912.

In Carniola the reafforestation of the Karst (1) was undertaken in virtue of a special law and through the agency of a commission appointed on October 11, 1886.

The agricultural and forestry conditions of the two Karst districts were according to the general land registry of 1870 as follows :

		Adelsberg acres	Loitsch acres
High forest	calcareous Karst soil	39 375	149 723
Coppice		5 053	6 491
Common pastures and alps .		67 006	57 395
Unproductive land		4 566	5 864
Agricultural land		83 911	79 458
Common pastures.	sandy Karst soil	21 704	—

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(1) The South European Karst region extends, for the major part in Austrian territory from the Alps to the borders of Greece and covers about 193 000 square miles. The Karst proper forms a limestone plateau on the Austrian and Carniola coast. The reafforestation of the Karst originated in a resolution passed by the "Oesterreichischen Reichsforstvereins" at Triest in 1865. After several attempts, this resolution was adopted in the laws for the reafforestation of the Karst, for the territory of the city of Triest on September 27, 1881, for the princely county of Görz and Gradiska on December 9, 1883, for the Duchy of Carniola on March 9, 1885, and for the March of Istria on May 7, 1886. The characteristic of these laws consisted in the constitution of a Commission for the reafforestation of the Karst, with powers to form a reafforestation registry, comprising all those lands which, in the interest of the country, it was deemed necessary to reafforest within a given time. The State was also given powers to expropriate such lands. In 1906 the reafforestation land registry bore the following :

	Karst Lands — sq. miles	Lands entered in the reafforestation registry — sq. miles
Triest	23.13	4.51
Görtz and Gradiska	748.26	31.98
Istria	1 411.32	53.10
Carniola (Adelsberg) . . .	2 878.14	14.27
Total . . .	5 060.85	103.86

(Cf. RUBBIA, K. Oedlandaufforstungen : Mittel zu ihrer Förderung (Die Aufforstung des Karstes in Oesterreich). — *VIII Internationaler Landwirtschaftlicher Kongress*, Sektion VIII, Referat 3, Bd. II, pp. 22. Wien 1907 ; LOREY'S *Handbuch der Forstwissenschaft*, Zw. Aufl., I. Bd., pp. 67-68. Tübingen, 1903 ; FERNOW, B. E. *A Brief History of Forestry, in Europe, the United States and other Countries*, Austria Hungary, pp. 158-159. Toronto, Ont.).

(*Ed.*).

Taking into account the unproductive lands and the pastures, 156 534 acres are to be considered as Karst lands.

According to the reafforestation register there were at the end of 1911:

	acres
Areas to be reafforested, Adelsberg	9 369.5
" " Loitsch	239.0
Total . . .	9 608.5
Of these, reafforestation has been carried out on	7 191
There remain to be reafforested	2 417.5

The 9608.5 acres entered in the reafforestation registry are divided as follows:

	acres
Collective property	6 862.0
Communal "	21.5
Private "	2 716.5
Expropriated "	8.5
	9 608.5

The data concerning the cost of reafforesting and of interculture are of practical interest:

Cost	Planting per 1000 plants		Planting per acre	
	Extremes	Average	Extremes	Average
Labour only	*4s 9d* to *8s 7½d*	*6s 6d*	*17s 3d* to £1 *15s 3d*	£1 *5s 9 ½d*
Total cost	*6s 0d* to *9s 11d*	*7s 10 ½d*	£1 *1s 11d* to £2 *0s 11d*	1 *11s 2 ½d*

	Filling up gaps per 1000 plants		Filling up gaps per acre	
Labour only. .	*4s 4 ½d* to *9s 0 ½d*	*6s 1 ½d*	—	—
Total cost . .	*5s 8 ¾d* to *10s 3 ¾d*	*7s 8 ½d*	—	*11s 7 ½d*

The above data refer to 6566 acres replanted with 26 043 270 nursery plants; and which required 18 491 440 plants (71 per cent) for gapping up, and with intercalary plantations and under covert, 1176 017 plants and 7116 lbs. of fine forest seeds on 1184 acres.

According to article 5 of the Law on reafforestation, the plants to the number of 44 180 577 (96.6 per cent.) were taken from the State nurseries at the nominal price of 10 *d* per 1000 plants, besides some free of charge; 545 050 were supplied by the Commission's nurseries and 984 700 from private nurseries; altogether 45 710 727 at an average cost of 11 ½ *d* per thousand.

As for protection, it is to be noted that of the 238 acres which were destroyed by fire, 144 acres were burned through imprudence, 41 by sparks from locomotives, 53 by unknown agencies. 19 612 feet of new firelines were made and 168 811 were re-established ; 122 360 ft. of new protection walls were built and 19 453 ft. were repaired, and 6 819 feet of wire netting were put up.

Out of a total of £27 101 set apart for all these works from 1887 to 1911, 75 per cent. is contributed by the State, 13.2 per cent. by the Province, 4.2 by other parties concerned and 7.2 from various sources. The expenses during the same period amounted to £27 005 8s, and of this sum 68 per cent. was spent in reafforestation proper, or 72.8 if the cost of nurseries and of protection is included; 0.4 per cent. was devoted to the purchase of land, 14.8 to surveillance, 0.4 to the reafforesting registry, 3.4 to the Commission, 2.2 to the secretary's office, 2.4 to rewards, and 3.6 to sundries.

From the sylvicultural point of view, experience has confirmed the excellence of Austrian pine for the Karst lands, planted on 91.6 per cent. of the area, in dense stands of 4 050 plants per acre, that is 3ft 3 in. by 3ft. 3 in. apart. For the higher and more exposed situations Corsican pine is especially useful. Above 2 000 ft., and in sheltered positions on good soils, Norway spruce thrives ; it has been used on 4.4. per cent. Notwithstanding the preference shown by the inhabitants for larch, because it does not prevent the growth of grasses, the plantations of this tree (0.32 per cent.) did not give good results, nor did the few specimens of Japanese larch grown do any better. Scotch pine (planted on 0.73 per cent.) does well in localities that do not get much snow and under covert of spruce, oak or ash. The results obtained with Banks' pine were negative. White pine is particularly useful for gapping up and for planting among other trees. White spruce, indigenous to the Karst, will play an important part in the work of reafforesting Karst lands, especially under covert of Austrian pine and Scotch pine, and in this way about 1 190 acres have already been planted.

Broad-leaved trees, which are now being planted experimentally, will also be an important factor in the Karst forest economy when the preliminary plantations of conifers have created suitable conditions. At present nothing can be stated about oak, but it appears that ash, sycamore, lime, common alder and, for the improvement of the soil, white alder, have given good results.

In conclusion, considering the success which has attended the work of reafforestation, it is to be regretted that provisions for the consolidation and economic utilization of the accomplished work should be wanting. The Ministry of Agriculture has, however, taken into consideration the proposals of the Commission as to the reform and necessity of bringing up to date the law on the reafforestation of the Karst, and has recognized that they are justified and opportune.

LIVE STOCK AND BREEDING.

HYGIENE

273 – Experiments on the Efficiency of Antirinderpest Serum.

WARD, ARDISBALD and WOOD, FREDERICK WILLIAM. — *Department of Public Instruction of the Philippine Islands, Bureau of Agriculture, Bulletin* No. 19. Manila, 1912.

The writers have made experiments with antirinderpest serum on cattle and buffaloes. Some of the serum used for inoculation was made by the experimenters themselves, while some was procured from the Pasteur Institute at Nha-Trang (Indo-China) and from the Experiment Station for Animal Diseases at Tokio. 175 animals were experimented upon in 11 separate experiments, 26 serving as a control and not being inoculated. All the animals were exposed to the infection of rinderpest. The experiments seem to show that antirinderpest serum does not prevent infection with rinderpest. On the contrary, animals injected with serum and exposed to rinderpest soon contract the disease and pass through a more or less modified attack It has been shown that the blood of animals is infective during this attack. If by passive immunity is meant an artificial condition by means of which the severity of the attack is lessened, the writers grant that such exists, but deny that there is a passive immunity of a kind that prevents invasion by the virus of rinderpest.

274 – Fracture of the Thoracic (Dorsal) and Lumbar Vertebrae in the Horse.

RUDAU, Georg. Zur Kenntnis der Brust- (Rücken-) und Lendenwirbelbrüche des Pferdes. — *Monatshefte für praktische Tierheilkunde*, Part 5-6, pp. 193-255. Hamburg, January 11, 1913.

Fractures of the vertebra in the dorsal and lumbar regions are not so frequent as those in the neck; nevertheless they form about 4 to 5 per cent. of all the fractures of bones in horses. Among them the first lumbar vertebra and the sixteenth to the eighteenth dorsal vertebrae are the most frequently broken. The writer distinguishes between outer (direct) and inner (predisposing) causes. Among the first he includes: leaping, falling, colliding, getting up under the travis beam, creeping through a fence, casting for an operation, etc. The effects are all the more dangerous as the inner causes (conformation of bones and muscles) predispose the animals to fracture. The bones are often the seat of the predisposing causes. Osteological investigations have proved that the vertebrae of the back and loins are not all equally developed. The strongest are those at the extremities of the column and the weakest those in the middle. In this part also the intervertebral disks, which by means of their elasticity deaden sudden shocks, are less developed. Consequently fractures happen more frequently here. The processes of the vertebrae are more strongly built than the body and the arch; in these the spongy mass predominates over the stronger compact substance; consequently fractures in the body and in the arch are more frequent than in the processes. Pathological alterations in the dorsal and lumbar vertebrae (exostoses), ossification of the intervertebral disks and of the articulations, rachitis, osteoporosis, etc., favour the action of direct agents. As further inner causes (seated in the muscles) the writer mentions the contractions of the long muscle of the back (*Musculus longissimus dorsi*). When horses kick violently or are cast down the spinal column is strongly curved, and if at the same time a contraction of the muscles takes place, the excessive strain upon the vertebrae causes them to fissure or to fracture.

The symptoms are different according to whether the body or the processes of the vertebrae are injured. In the latter case the spinal chord rarely suffers, whereas in the former it does so frequently and presents the following symptoms:

1) Paralysis of the hind quarters (sitting position of the animals).
2) Dropping or retention of urine.
3) Perspiration.
4) Dyspnoea, frequency of pulse.

Symptoms accompanying fissure are:

1) Unsteady hind quarters.
2) Curved back.
3) Stilted gait.
4) The animals are capable of working (even for several weeks) until the fissure turns into a fracture.

The diagnosis of fractures of the vertebral processes are easier (sensations of pain, resting position of the animal); their prognosis is also more favourable (cure is possible).

The author recommends for fissures of the vertebrae (eventually curable), rest, tying the animals so as to prevent them lying down, and administration of phosphate of lime. Fractures of the vertebral processes are curable; rest is necessary, as well as removal of the splinters of bone. Fractures of the body of the vertebra are incurable.

275 – **Pigments carried by Cattle.**

BREEDING

DAVIES, C. J. in *Live Stock Journal*, Nos. 2024 and 2025, pp. 62 and 85-86. London, January 17 and 24, 1913.

Although a good deal of work has been done of late in investigating the pigments carried by the smaller mammalians, no similar investigation seems to have been carried out on cattle. The writer has endeavoured to supply this deficiency.

The method he adopted was to place a small tuft of hair in a watch-glass and a few of the same hairs in the well of a microscope slide, covering each with a 40 per cent. solution of caustic potash. On the slide the progressive dissolving out of the pigment could be watched from day to day without disturbing the hair; in the watch-glass the hair was microscopically examined, washed and transferred to a fresh potash solution when one pigment had dissolved out. The operation was repeated.

Three pigments were found by the above method: yellow, brown and black.

The yellow pigment commences to dissolve out almost immediately. The pigment takes more than four and less than nineteen hours to completely dissolve out. The solution is bricky red. The pigment granules appear under a high magnification to be circular nucleated cells.

The brown pigment is found dissolving out from hair washed free of yellow granules, but not before 29 hours after setting in potash solution; after 68 hours in all, the hair is, as a rule, free of this pigment, which gives the liquid containing it a pale yellowish colour. The granules of this pigment, besides being smaller, are irregularly shaped and invariably cluster together.

Black. This pigment dissolves exceedingly slowly and is difficult to isolate. Hairs with black pigment at the end of a fortnight's immersion in caustic potash appear bright brown under the microscope. The black pigment granules are exceedingly small, circular in shape and do not as a rule cluster together.

The investigations bore on the hair pigments of several English breeds of cattle, and their results seem to point to the universality of considerable quantities of yellow and brown pigments in every breed; traces of black are found in all the animals examined, though not invariably in every hair.

It appears thus that as cattle all carry the same three pigments, their varying colours are obviously due to the respective quantities and arrangements of these pigments. It seems that yellow and black overlying brown gives dun; yellow only overlying brown gives yellow or red, according to the quantity of yellow present; thickly packed black and brown, even when covered by a thin layer of yellow, gives black. Yellow in any quantity in the tip makes the hair "rusty".

The writer treats further of the inheritance of colour, which he believes occurs on Mendelian lines, and that in general, in a cross, the darkest type of pigmentation dominates over the lighter one, or rather covers it.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

276 - Stock Breeding in the Kivu (Belgian Congo).

CARLIER. L'Elevage au Kivu. — *Bulletin agricole du Congo belge*, No. 3, pp. 741-755; No. 4, pp. 775-798. Brussels, September and December 1912.

The geological, topographical and climatic conditions of the Belgian Congo are by no means uniform, and for this reason the fauna and flora vary in the different part. While the southern tribes (Babuye and Wabembe) chiefly keep goats, sheep and fowls, the neighbouring Wawira have already domesticated the cow; among the Warundi, Watembo and Wanyabongo, the latter animal is generally kept, some of the natives possessing herds of 1 000 head.

I. *Fowls.* — These are very widely kept and are especial favourites with the Wanyabongo tribe; they are the property of the women. The fowl of the country is small, active and pugnacious; the hens lay about 10 eggs before sitting. Less common is the Arab fowl, a product of a cross with Orpingtons, or other English breeds.

II. *Goats.* — Here too, this is the "poor man's cow". The writer distinguishes two breeds: the one long-haired, which yield little milk, and the other short-haired and with good milking properties. The latter are said also to fatten well.

III. *Sheep.* — The management is the same as for goats. The breed is small and has a fat tail; it gives no wool. Sheep are chiefly used for barter in the native markets.

IV. *Cattle.* — Some of these are indigenous and others have been imported from German East Africa. Three types are to be distinguished; they are chiefly characterised by late maturity and a prominent hump like a zebu's, they are red or black. The writer distinguishes three types:

1. Hornless cattle ("Sungu"). Height at withers nearly 4 ft.; back straight; ears long (about 7 ½ in.; rump and thigh well developed. Milk breed.

2. Cattle with short horns. Found where the climate is less extreme (Wanyabongo). They are larger than the cattle first mentioned. The muzzle is broad and short, the horns are directed upwards and bent forwards; face slightly dished. The back is somewhat hollow, while the large belly betokens a plentiful food supply. The chest and limbs are powerful and well-developed as is also the udder.

3. Cattle with long horns. Head light; horns strong, 28 to 40 inches long. Muscular system and bones poorly developed. This is the least valuable breed.

Although no systematic breeding is practised, yet the natives are guided by certain general rules in breeding. As the grass in the meadows is scanty in the dry season, the herds are then driven to the often distant river valleys and swampy land. They are always under the supervision of a herdsman, who has a personal interest in the number of calves produced.

The inhabitants hardly take milk except as cheese. The Wanyabongo obtain the curd spontaneously by letting the milk stand a long time, while the Nya Ruanda mix a little urine with it and the Warundi use slices of the fruit of a citrus tree called "Nongo." Butter-milk is used chiefly as an article of food for women and children while the former use butter as a toilet preparation.

The flesh of the fowls, goats and cows is eaten by the natives, while the skins of the two latter are turned to account by them. The manure is collected from around the huts and used for fuel or for the banana or tobacco crops.

Markets ("Sokos") are held regularly at fixed places and afford an opportunity for the exchange of cattle, sheep and meat.

In the last chapter, the writer mentions the most serious cattle diseases.

277 - Horses and Horse-Breeding.

HORSES, ASSES AND MULES

Bush-Brown, H. K. in *The American Breeder's Magazine*, Vol. 3, No. 4, pp. 282-289. Washington, October-December 1912.

In a former article the writer suggested that the structure of the best race horses, both trotters and runners, should be studied in their living active form and from the skeleton after death as a means of establishing a method of defining types and of ascertaining which structural forms are the most favourable to speed and endurance. The greatest differences between breeds are largely due to the structure of the skeleton. And this suggests the need of an accurate method of measurement based upon a unit common to all individuals. The writer recommends as a base the height of the horse at the withers (1), which is divided into three equal parts denominated "heads". Each head is further divided into four parts, called "quarters," and each quarter into six parts called "minims".

These denominations are abbreviated to H for heads, N for quarters and M for minims. All the measurements of the body of a horse are to be given in these measures, and as the basis of all of them is the height at the withers an exact representation of the proportions of the body of every horse measured with this system can be made.

The writer gives several figures further illustrating his system, which he recommends also for the measurement of cattle; but instead of taking the height of the cow at the withers it is necessary to take the length from the front of the shoulder to the end rump bone or ilium.

278 - Forage Rations for Growing Horses.

SNYDER, W. P. in *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Art. VIII, *Bulletin* No. 130. Lincoln, Neb., 1912.

At the agricultural experiment station of the Nebraska University, foals were kept from October 1907 to January 1911 on various pastures and with various winter rations. The experiment was commenced with 32 colts, of which 16 were males, 9 mares and 7 mules; the mules, with one exception, were sired by the same jack. The colts, also with one exception, were sired by a pure-bred Percheron stallion. The dams were chiefly Montana mares.

The colts were allowed to run together in an alfalfa field from October 1907 until January 1, 1908, when they were divided into separate lots, and fed as follows:

Lot 1, Alfalfa hay in winter, and alfalfa pasture in summer.
Lot 2, Alfalfa hay in winter, and prairie pasture in summer.
Lot 3, Prairie hay and cane hay in winter and prairie pasture in summer.

The grain for all lots during the first winter was 4 lbs. per head daily, consisting of two-thirds corn and one-third oats. Later they were given a more abundant grain ration when they worked (when three years old).

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(1) The height at the withers has been used by S. v. Nathusius of Halle for years as the basis in the measurement of horses; the other measures being expressed by him in percentages of this basis according to the method adopted by A. Kraemer and H. Lydtin for cattle measurements.

H. Krämer of Hohenheim is opposed to the use of the height at the withers as a basis for the measurement of horses.

See: S. v. Nathusius, Pferdemessungen in *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 43, 112 and 205. Berlin.

H. Krämer, *Aus Biologie, Tierzucht und Rassengeschichte*, p. 260 *et seq.* Stuttgart, 1912. *Ibid.* *Das schönste Rind*, III Edit., p. 31 *et seq.* Stuttgart, 1912. (*Ed.*).

TABLE I.

Lot	First winter Jan. 1, 1908, to June 15, 1908	First summer June 15, 1908, to Oct. 31, 1908	Second winter Oct. 31, 1908, to April 21, 1909	Second summer April 21, 1909, to Nov. 2, 1909	Third winter Nov. 2, 1909, to March 18, 1910	Third summer March 10, 1910, to Dec. 1, 1910	Fourth winter Dec. 1, 1910, to Jan. 14, 1911
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	152.5	244.5	5.5	181.5	— 20.6	39.7	77.3
2	142.2	93.8	95.0	107.7	22.6	120.7	41.6
3	99.5	113.5	4.5	191.0	— 64.8	133.3	63.0

Lots 1 and 3 lost weight during the third winter.

TABLE II.

		Lot 1	Lot 2	Lot 3
Number of colts		10	9	10
Average first weight, January 1, 1908		588.5 lbs.	617.7 lbs.	617.7 lbs.
Average last weight, January 14, 1911		1268.4 »	1228.3 »	1157.5 »
Average gain		677.9 »	610.6 »	540.0 »
Cost of feed .	Grain	$ 8.41	$ 8.41	$ 12.28
	forage	» 31.80	» 31.80	» 20.93
	pasture	» 25.09	» 12.27	» 12.27
Total cost of feed per colt . . .		» 65.30	» 52.48	» 45.48
Av. purchase price		» 57.00	» 53.70	» 52.00
Interest at 6 per cent. on purchase price		» 10.38	» 9.78	» 9.47
Total cost per colt, January 14, 1911		» 132.68	» 115.96	» 106.95

Lot 3 was fed grain during the second winter also.

Two lots were composed of 11 colts and one of 10. In two of the lots there were two mule colts each and in one three.

In March 1908, when the colts were not yet one year old, distemper attacked those in Lots 1 and 2. Three of them died. The colts in Lot 3 were at a certain distance from the others; they fell sick later and not severely. The male colts were castrated in June 1908; when they were three years old all of them were broken and worked.

The average gains per head are shown by Table I. Table II gives the average weights, costs of food, etc.

The results of the experiments may be summarized as follows :

It appears that it is profitable to pasture alfalfa when the colts are sold as yearlings or two-year-olds, or when there is some special incentive for getting rapid gains, or when the cost of alfalfa pasture and of native grass pasture are about equal.

Alfalfa pasture put the colts in excellent condition and produced no injurious effects.

Feeding alfalfa hay in winter was profitable ; it produces more increase in weight on colts than prairie hay and cane hay. In spring colts put on pasture when thin in flesh make better gains than similar colts put on pasture when in good flesh.

The gains in weight were greater in the first year than in the second, and greater in the second than in the third year.

279 - **Jersey-Angus Cattle.**

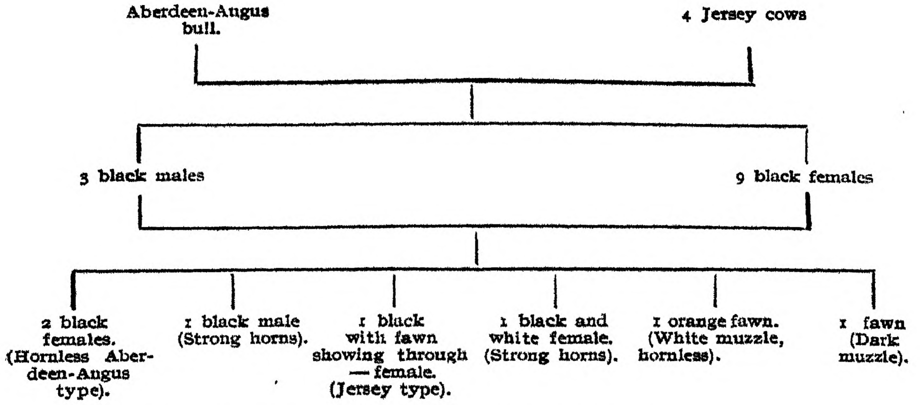
PARLOUR, WILLIAM in *Live Stock Journal*, Vol. LXXVII, No. 2025, p. 85. London, January 24, 1913.

The writer gives an account of the results of Jersey-Angus crosses, which were made in the north of England by an owner, who, finding that Jerseys could not stand the severe climate of that part of the country, wished to try to combine the milkfat-producing properties of the Jersey with the flesh-producing properties of the Aberdeen-Angus breed.

The first cross, that of an Aberdeen-Angus bull with a Jersey cow, was eminently successful. The calves from such crosses were all black, one female only showing a patch of white near the udder. There are traces of the Jersey in the udder (which is yellow, well shaped and silky), and the inside of the thighs and the ears are also covered with hairs, as is the case with the latter breed. The females were all polled, but the males, with age, usually developed embryo horns, or scurs.

A number of the cows have produced calves and all but one have been as good milkers as their dams. The steers, which were only slightly larger than the Jerseys, have fattened readily and fetched good prices.

The first cross females have been crossed with sires of precisely the same breeding as themselves, but the offspring are of varied colours and characteristics. The following table shows how the herd is progressing :


Aberdeen-Angus bull.
4 Jersey cows
3 black males
9 black females
2 black females. (Hornless Aberdeen-Angus type).
1 black male (Strong horns).
1 black with fawn showing through — female. (Jersey type).
1 black and white female. (Strong horns).
1 orange fawn. (White muzzle, hornless).
1 fawn (Dark muzzle).

The sex of the last two animals in the third generation is not given. (*Ed.*).

280 – Crosses between Algau and African Cattle.

SPANN. Kreuzungen zwischen Algäuer und Afrikaner Rindern. — *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 2, pp. 18-19. Hannover, January 10, 1913.

After the rinderpest had destroyed the greater number of the cattle in German South-West Africa, about 10 years ago, the Government, amongst other measures for the encouragement of cattle-breeding, tried importing Algau bulls.

Encouraged by the success of this attempt, Hr. Hüttenhain, a farmer, made crosses between Algau bulls and the native Bechuana and Griqualand cows. The Bechuana cattle, bred in Bechuanaland, are usually whole-coloured, reddish black, red, or light with dark pigment. The height at the withers is 55 to 60 inches; the long narrow head bears well-developed horns, which curve upwards like those of the Hungarian Steppe cattle. The ribs are slightly curved and the back is rather hollow. The animals narrow behind the shoulders; the rump is very sloping. They are nearly always knock-kneed and have long legs.

The Griqualand West cattle, from the Cape Province, are usually all red; they also have sloping rumps, but their horns are much smaller than those of the Bechuana breed.

Both breeds are reared only for working purposes. During their first lactation period, the cows give one to two quarts of milk daily; this later increases to two to three quarts. It contains 7 to 8 per cent. of fat.

For crossing with Algau bulls, whole-coloured red cows were selected. The resulting offspring had relatively well-formed backs. The head of the Algau bull was inherited unchanged. The rump was broad and the tail was set on higher. The horns had only a third of the spread of those of the dam's and were weaker. The colour of the heifer calves is mouse-grey, like that of the Montavon breed, but with a little dark red showing through and a pale stripe down the back, as well as light belly. The bull-calves are light in colour when young, but become dark in a few months; the stripe down the back persists. All the cross-breds had slate-grey muzzles, white horns with black tips and black hoofs. Without forfeiting much of their capacity for work, the animals increased in weight, while the cows yielded more milk, giving over five quarts after the first calf, and seven quarts after the second.

The above-mentioned bull was 1 $^3/_4$ year old in 1906, when brought from Algau. At the present time, its descendants on Hr. Huttenhain's farm number 150. Although seven years old, the bull is still used for service. Like all the other Algau animals, it is well acclimatised.

With regard to the fodder supply, Algau cattle are very suitable to German South-West Africa. The best age for exporting them to Africa seems to be two years ; if sent out younger, their growth is checked.

SHEEP

281 - Breeding Experiments with Welsh Mountain Breeding Ewes.

University College of North Wales. Bulletin VII. Bangor, 1912.

The experiments on the use of rams of various breeds with Welsh mountain ewes, which were undertaken at the Aber Experimental Farm of the University College of North Wales for the production of fat lambs, were commenced again in the autumn of 1911, after a break of two years. It was found that the best butcher's lambs were undoubtedly the Southdown-Welsh cross ; next to these came the Wiltshire cross.

For the season 1911-12, it was determined to test these two well-proven crosses against others that had not previously been tried. For this purpose, five lots of ewes were selected, 25 in each lot ; these were mated with Southdown, Wiltshire, Hampshire, Romney Marsh and Wensleydale rams. The lambs were dropped between March 4 and April 6. Particulars of the lambs are given in the following table. The lambs were, as usual, sold to the butcher as soon as they became fat.

Lot	Description of ram	Ewe	Number of lambs dropped	Percentage of lambs sold			Average live weight of lambs when sold		
				On or before July 11	On or before Aug. 12	On or before Oct. 31	On or before July 11 lb.	On or before Aug. 12 lb.	On or before Oct. 31 lb.
I	Southdown . . .	Welsh Mountain	27	81	19	—	66	64	—
II	Wiltshire		11	60	40	—	70	74	—
III	Hampshire . . .		29	67	26	7	70	67	75
IV	Romney Marsh .		26	64	36	—	73	73	—
V	Wensleydale. . .		26	54	33	13	70	74	74

It will be seen that the Southdown-Welsh Mountain cross gave the highest percentage of lambs fit for the butcher at the earliest date ; but they were not the heaviest in weight.

282 - Introduction of Karakul Sheep into Argentina.

GARCIA, TOMAS R. Los ovinos Karakul. Generalidades sobre el origen y la importación al País. — *Boletin del Ministerio de Agricultura,* Vol. XIV, No. 10, pp. 1145-1178. Buenos Aires, 1912.

The Karakul breed of sheep, which has been introduced into Russia, Bosnia-Herzegovina, Austria, Germany and the United States, was introduced into Argentina in 1911 by means of a small flock (16 ewes and 4 rams) presented by the Emperor of Austria to the President of the Argentine Republic. The small flock is now tended with care in the "San Nicanor" establishment, Sierras del Azul, near Vela. It is intended to form there a centre for raising the pure breed and at the same time to study the advantages of crossing it with the sheep of the various regions of Argentina. The writer believes that for crossing purposes the hardy native breed or "criolla" will prove the best. Should the Karakul breed become so numerous in Argentina as to become of practical importance, the writer believes that the region that will suit it best, both for the conditions of life of the inhabitants as well as for the physical nature of the country, will be especially the north-west of the Republic. The breeding of Karakul sheep can be carried on in the Calchaquies valleys; in the del Toro valley in the north of El Candado; in the Pampa grande, La Alemania, Inca Huasi; in a great part of the plateaus and mountains of the province of Salta, in the Humahuaca valley; in almost all the mountainous region in the west of the province of Jiujuy; in the Andine provinces; the pre-Cordillera valleys and lastly in many of the southern territories, especially in their western part bordering on the Cordilleras.

As is well known, the most valuable product of Karakul sheep is the skin of the recently born or unborn lambs. These skins during recent years have attained the average price of 15*s* 10*d* and a maximum of 63*s* 3*d*, untanned. The tanned skins fetch in Buenos Aires from 34*s* 11*d* to 69*s* 10*d* each.

283 - Pig Feeding by means of Automatic Troughs.

PIGS

LEPEL-FREISTATT. Schweinefütterung an automatischen Futterkästen, und deren Bedeutung für Mast, sowie Zucht und natürliche Schweinehaltung. — *Deutsche Landwirtschaftliche Presse,* Year 40, No. 7, pp. 74-75. Berlin, January 22, 1913.

Frequently the advantage of early fattening is rendered questionable when it is attained by costly pig-sties and want of exercise. Should illness break out, or great variations arise in the cost of barley or the price of pigs, the sties, being useless for other purposes, are often empty for months.

The writer therefore recommends the automatic dry-feeding of pigs (1); this process offers the following advantages in fattening:

1. Special fattening sties with fixed troughs are no longer necessary; any space (shed, empty cow-house, barn) which has a good floor can be turned to account, provided there is ample drainage.

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(1) See No. 1660, *B*, Dec. 1912. (*Ed.*)

2. Runs are easily attached to these sties.

3. A large number of animals, 20 to 100, of different ages and size can be kept in such a place.

4. The pigs can eat as much as they want without wasting the food.

The writer considers automatic dry feeding equally suitable for breeding pigs ; but sows with young pigs should be given a lighter and larger sty; also the young pigs must be marked and accustomed to running about and movement before they are placed with the others (at the age of 3 to 4 weeks). It is well to divide off a small run from the sow's pen, which should have apertures allowing the young pigs access to the dry food in order that they may become accustomed to it. For about a fortnight before and after weaning the young animals must be given liquid food (skimmed milk, whey) in addition to the dry food.

POULTRY

284 - The Influence of Selection on the Size of Fowls' Eggs.

Einfluss der Zuchtwahl auf die Grösse der Hühnereier. — *Landwirtschaftliche Zeitschrift für Oberösterreich,* Year 57, No. 2, pp. 9-10. Linz, January 15, 1913.

The Cooperative Egg-Societies of Upper Austria, which since 1905 have bought eggs by weight, have announced that their members have during 7 years increased the average weight of fowls' eggs from 1.91 oz. to 2.01 oz. by means of careful selection, good food and proper management.

The Otterbach Poultry Breeding Institution gives the following figures.

Average weight of eggs (in ounces)

Year	Partridge Italian				Golden Wyandottes			
	1-year	2-year	3-year	all ages	1-year	2-year	3-year	all ages
1905	1.86	2.04	1.95	1.92	1.83	—	—	1.83
1907	2.07	2.12	2.04	2.09	2.05	2.11	1.99	2.06
1909	2.14	2.18	2.12	2.13	2.06	2.07	2.10	2.08
1911	2.04	2.07	2.18	2.07	1.99	2.06	2.07	2.02
Average (1)	2.04	2.11	2.08	2.06	2.00	2.07	2.07	2.02

(1) In reckoning the averages, the weights of the eggs of 1906, 1908 and 1910 were included.

Proportions of the Weight of the Eggs.

Year	Partridge Italians.				Golden Wyandottes			
	Eggs of 1.76 to 1.94 oz.	Eggs of 1.94 to 2.12 oz.	Eggs of 2.12 to 2.29 oz.	Eggs over 2.29 oz.	Eggs of 1.76 to 1.94 oz.	Eggs of 1.94 to 2.12 oz.	Eggs of 2.12 to 2.29 oz.	Eggs over 2.29 oz.
	%	%	%	%	%	%	%	%
1905	50	50	—	—	100	—	—	—
1907	11.2	55.5	25.9	7.4	20.0	46.7	33.3	—
1909	3.3	30.0	60.0	6.7	7.1	64.3	28.6	—
1911	7.4	66.7	25.9	—	18.2	77.3	4.5	—
Average.	17.2	49.5	29.8	3.5	27.9	49.3	22.8	—

285 – **Farm Flock Poultry Competition.**

TOOLE, A. A. *in The Farmer's Advocate*, Vol. XLVII, No. 1054, pp. 1634-1635 and 1702. Winnipeg, Canada, December 4, 1912.

The Norfolk Poultry Association organised in the winter 1910-1911 in Norfolk County, Ontario, a competition among the poultry flocks of the farms of the district. The following were the rules of the competition.

1. No entry fee will be charged and all farmers in the County of Norfolk complying with the rules hereinafter stated are eligible for entry.

2. That only those farmers having flocks of 35 or more birds will be eligible for entry.

3. That each farmer entering the competition will keep a daily record of the egg yield of his flock on blanks furnished him by the Association for that purpose, from the first day of December 1910, till the 31st day of May 1911 inclusive.

4. That each farmer entering the competition will keep a financial statement, showing the kinds, amount and cost of food fed to his flock, and the total receipts from the same during the six months between the 1st day of December 1910, and the 31st day of May 1911.

5. That each farmer entering the competition will sign a written declaration or affidavit, affirming that the record of the egg yield and the financial statement of his flock, referred to in Rules 3 and 4 and made by him, are correct statements of the truth, and that he will forward the same to the Secretary of the Association, not later than the third day of June 1911.

6. Any competitor who discontinues keeping the records referred to in Rules 3 and 4, at any time during the competition, will be disqualified.

7. All entries must be made on or before November 25, 1910.

8. The judges appointed by the Association will visit the farm of each competitor at least once, and oftener if deemed necessary, some time during the competition in order to see the flock and the management by the owner.

The competition was advertised through the medium of local newspapers and special printed matter. Twenty-two entries in all were received.

Professor W. R. Graham, of the Ontario Agricultural College, undertook the task of judging the flocks at the different farms, using the score card which was set by the Norfolk Poultry Association, in which 250 points were the maximum given for the condition of the flock, 150 points for the cleanliness, etc., of the fowl-house, and 450 for the management of the flock (method of feeding, care and sale of eggs, marketing of table fowls, number of cocks, cocks removed from flock after breeding season, financial statement, including profit, egg-yield).

Some houses were found on inspection to be in a somewhat dirty condition, others were remarkably clean. Ventilation by means of cotton in the windows instead of glass was in evidence in the majority of the houses.

Only three flocks of the 22 were mongrels and the breeds were of many kinds, including Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, Leghorns and Minorcas.

At the conclusion of the contest, the competitors sent up their information to headquarters and a meeting for the purpose of encouraging improved measures of poultry keeping was held at the county town.

Table I gives a summary of the costs and profits of the individual flocks :

TABLE I.

Number	Breed	Number of hens	Grain per hen per month lbs.	Cost per hen per month cents	Eggs per hen per month	Profit per hen per six months cents
1	Plymouth Rock	50	7.5	9.0	11.7	67.74
2	»	39	6.3	7.5	13.2	93.3
3	»	52	6.3	7.7	8.0	32.6
4	»	49	5.4	8.0	10.5	59.0
5	»	70	5.9	5.4	4.1	4.54
6	Leghorn	95	4.9	8.2	16.6	135.1
7	»	85	5.3	7.1	12.9	87.9
8	»	58	5.1	6.0	10.0	57.8
9	»	126	4.2	7.5	10.9	66.0
10	»	90	5.7	5.5	7.2	33.1
11	»	87	5.0	5.1	8.3	46.6
12	»	85	5.6	5.7	10.1	64.1
13	Wyandotte	35	8	10.7	16.05	73.9
14	»	140	7.6	8.4	7.4	20.5
15	»	69	7.2	9.8	8.4	24.4
16	Cross bred	70	5.6	6.06	8.9	48.4
17	»	51	9	9.3	11.3	53.7
18	»	48	5.4	6.6	10.7	63.9
19	Orpington	114	5	7.4	8.3	47.5
20	Rhode Island Red	45	5.2	5.5	11.9	89.6
21	Minorca	70	7.8	9.0	10.0	41.4

The profit, *i. e.* the amount received for eggs above the cost of feed, for the six months from December 1 1910 to May 31 1911, averaged for all the 21 flocks 57.67 cents per hen, or 57.67 dollars per 100 hens. The best results ($1.97) were obtained by No. 6, the flock which won the competition.

Five of the competitors continued their records till December 1, 1911; the results are given in Table II.

TABLE II.

Number	Breed	Number of hens	Grain per hen per year lbs	Cost per hen per year cents	Eggs per hen per year	Profit per hen per year cents
1	Plymouth Rock	50	63.4	78.0	128.2	104
6	Leghorn	95	50.4	77.5	157.4	197
8	»	58	50.4	60.0	123.2	119
19	Orpington	114	49.5	70.0	85.5	85
20	Rhode Island Red	45	53.	58.8	124.8	115

The writer further sought to discover the cause which determined the profitableness of the different flocks, and came to the conclusion that this is not to be found so much in the breed, as in the feeding and management of the fowls. The best results were obtained where the flocks were given buttermilk and green food, and where the fowl-house was well ventilated. Further figures are given in support of this view.

286 - Methods of Protecting Fish Ponds from Frost.

FISH

HEYKING, H. Vorbeuge vor Frostschäden in der Fischerei. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 3, p. 27. Berlin, January 8, 1912.

The layer of mud which covers the bottom of lakes and ponds is in a continual state of decomposition, thereby giving rise to marsh gas, sulphuretted hydrogen and ammonia. When the pond is frozen, these more or less poisonous gases pervade all the water and adhere in the form of bubbles to the lower surface of the ice. If the ice is covered with snow, so that the light cannot reach the water, the microspic water plants are unable to absorb ammoniacal nutritive substances and to give off oxygen. As soon as the supply of oxygen in the water is exhausted the fish thus perish from suffocation.

In order to prevent, or remedy, this want of oxygen, the writer suggests the following methods.

The pond in which the fish pass the winter should under no circumstances be overcrowded. Fish should not be kept through the winter in ponds where the mud stratum is more than from 8 to 12 in. thick; but if circumstances necessitate the use of such a pond, it must be left dry from the month of August, at latest, until the time for stocking it. This allows the mud to settle and the acids to escape from the surface. The application of phosphate of lime to the soil is much to be recommended. Moor ponds should be dragged in autumn or summer with a chain or heavy rope, to facilitate the rise of poisonous gases.

When the water freezes, the supply and discharge channels should be kept constantly open. If, however, the water supply is insufficient, it is necessary to try to get rid of the decomposition gases by dragging to and fro under the ice a so-called "Strohleine" (a rope furnished with wisps of straw at intervals of a yard). The rope can also be weighted and drawn along the bottom, so that the gases may rise and escape through the ice-holes. At the same time, the surface of the ice should be kept as free from snow as possible, so as to allow of the development of the small green algae and cause them to give off oxygen.

The appearance of different water insects in the open supply channel of the pond is a sure sign of the water becoming foul. First comes *Corisa,* which is followed soon by *Nepa cinerea* and *Notonecta glauca.* As the pond weeds on which these insects pass the winter have already decomposed, they seek oxygen in more wholesome waters. If no suitable remedy is found, during the next 24 hours *Ranatra linearis* makes its warning appearance. The advent of *Hydrophilus piceus* denotes that the greater number of the fish are congregated round the edges of the pond beneath the ice seeking in vain for water richer in oxygen and are destined there to perish miserably.

287 - Experiment in Feeding Carp on Acorns at Trachenberg, Germany.

HEROLD, R. Eichelfütterungsversuch in der Teichwirtschaft Trachenberg. — *Allgemeine Fischereizeitung,* Year 38, No. 3, pp. 60-61. Munich, February 1, 1913.

This experiment was made by the writer last summer. Carp, one summer old, were placed in a pond badly supplied with nutritive substances, and fed for three months exclusively upon crushed acorns. The fish remained healthy. They were weighed before and after the experiment.

Results: 8.85 cwt. of crushed acorns, costing 8*s.* 10*d.* delivered at the pond, produced 1.9 cwt. of fish for the table.

FARM ENGINEERING.

ICULTURAL
ACHINERY
AND
PLEMENTS

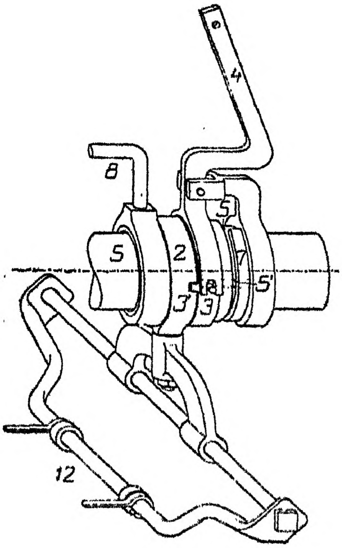
288 - Watzl's Regulator for Ploughs.

REZEK, I and RICHTER, L. Pflugführung Watzl. K. k. Hochschule für Bodenkultur. Prüfungsstation für landwirtschaftliche Maschinen und Geräte. — *Wiener Landwirtschaftliche Zeitung,* Year, 63, No. 3, p. 27. Vienna, January 8, 1913.

The regulator for ploughs shown in the annexed figure is used as follows:

The hollow cylinder 5 is fastened by means of the set screw 8 on the more or less cylindrical beam of an ordinary plough, while the shackle 12 is fastened anyhow to the wooden or iron fore-carriage of the plough.

The regular working of the plough is based on the fact that the ring bearing 2, in which the above-mentioned hollow cylinder 5 is borne, being fixed to the fore-carriage, cannot revolve round the axis of the beam; and in the position shown in the drawing the rotation of the cylinder 5 (and consequently the rotation of the plough beam) is prevented by the ring 3 which works in the groove 5' of the cylinder 5 by means of the small springs 3' and is coupled to the bearing 2 by the butt ends of the springs 3' catching in a notch of the bearing 2.



This coupling of the ring 3 with the bearing 2 is maintained, while the plough is working, by the spring 7 which presses the ring 3 against the bearing 2. When the plough reaches the end of the furrow the lever 4 is pulled by means of a string, the other end of which is fastened to the handles, and overcoming the resistance of the spring 7 the ring 3 is pushed so far forward as to be released and free to turn with the hollow cylinder 5 and the whole plough beam. Thus the plough can be turned over as is usually done at the end of the furrow. When a new furrow is started the ring 3 couples automatically with the bearing 2.

Experiments have demonstrated that even imperfect wooden ploughs, or ploughs composed of parts not really belonging together, if provided with Watzl's regulator can be made to proceed as evenly in the furrow as the best modern iron ploughs, thus greatly facilitating the work of ploughing where modern implements have not yet been introduced.

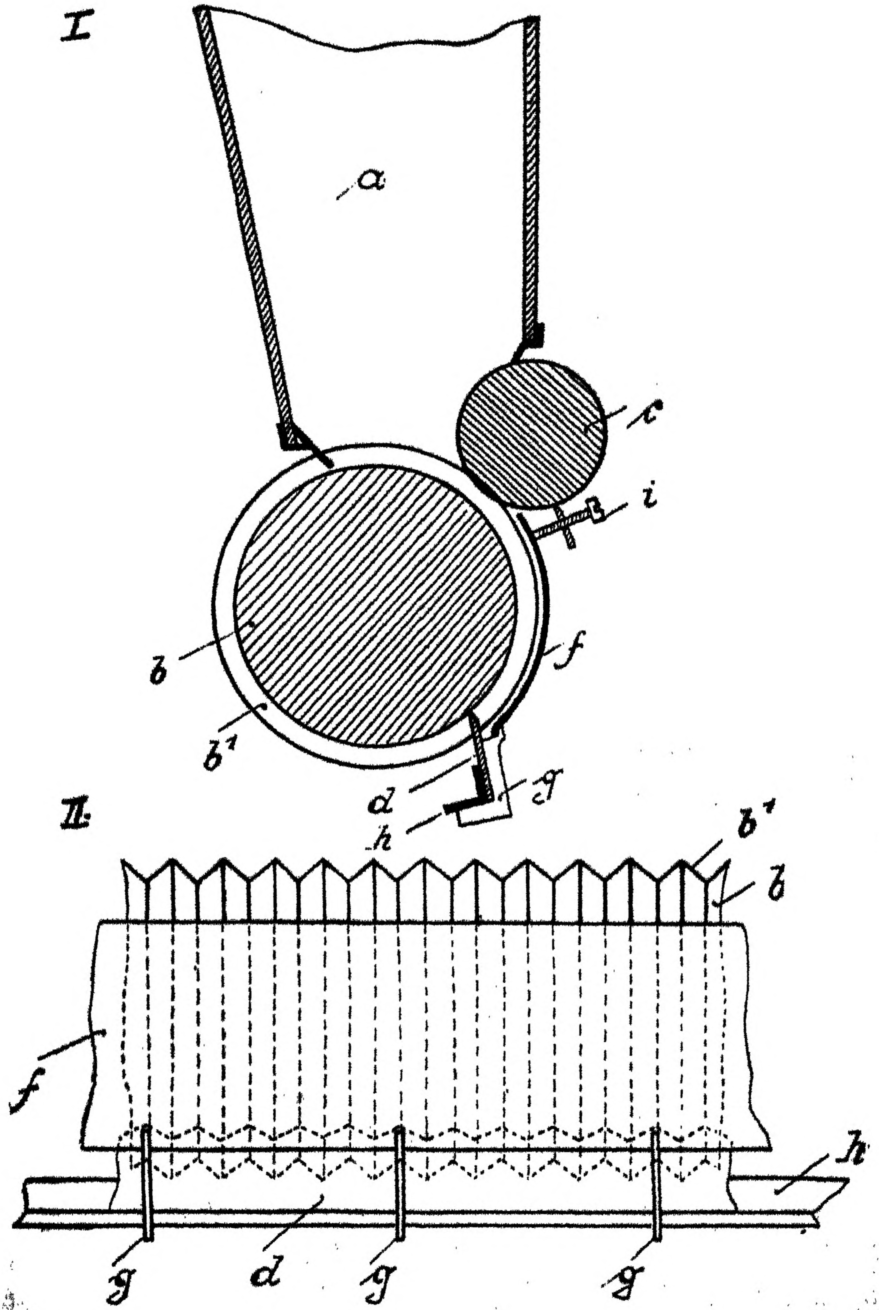
The writers believe that this regulator can be still further simplified without impairing its efficiency.

289 - Distributors for Solid and Liquid Manures.

Aus neuen Patent-Schriften. — *Landwirtschaftliche Maschinen und Geräte*, 12th Year, No. 32, pp. 21-22; 13th Year, No. 1, p. 19. Artern, December 28, 1912, and January 4, 1913.

The essential merit of this machine, the subject of two patents in Germany, consists in the even distribution of manure. Figs. I and II show the distributor for solid manures, in which the uniformity of distribution is obtained by means of a concave case which covers the distributing roller from the point at which the fertilizer falls onto it from the hopper, to the scraper. The space between this case and the roller can be increased or diminished so that the quantity of manure can be regulated.

The manure in the hopper (*a*) falls on the grooves (*b'*) of the roller (*b*), by which it is carried to the scraper; this rubs off the manure which has been pressed into the grooves by the counter roller (*c*) and allows it to fall to the ground.


I
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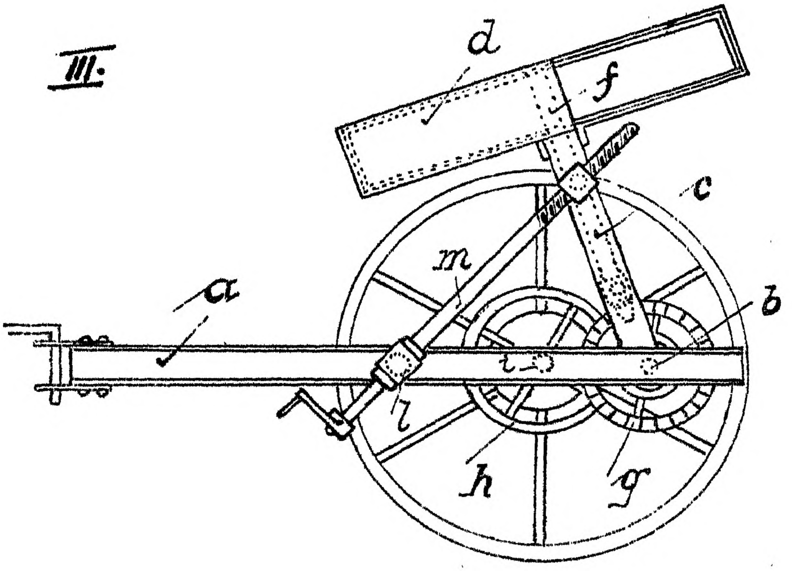
III.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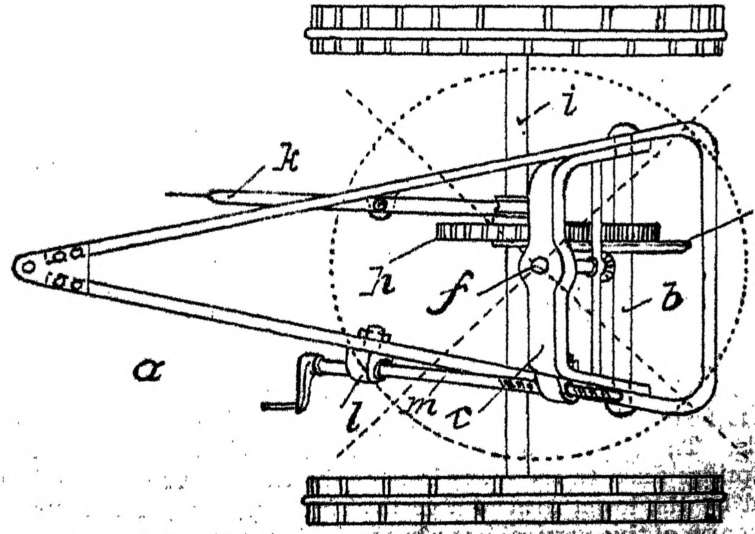
IV.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In the figure the case is shown in (*f*) and a bar of angle iron in (*h*). This bears an angle of sheet iron (*g*), to which the case is attached. The set screws (*i*) serve to regulate the position of the case.

Figs. III and IV show the distributor for *liquid manures*, in which the distributing disk can be given different degrees of inclination to the surface of the ground. This distributor consists of a frame (*a*) bearing a U-shaped support (*c*), which, by means of the shaft (*b*), pivots on the frame. It carries the shaft (*f*) of the distributing disk. This shaft is caused to revolve by the spurred gears (*g*) and (*h*), which are connected with the driving axle (*i*) and thrown into or out of gear by the lever (*k*). With the object of shifting the position of the support (*c*), a swivel bearing (*d*) in which a worm shaft works, is attached to the frame.

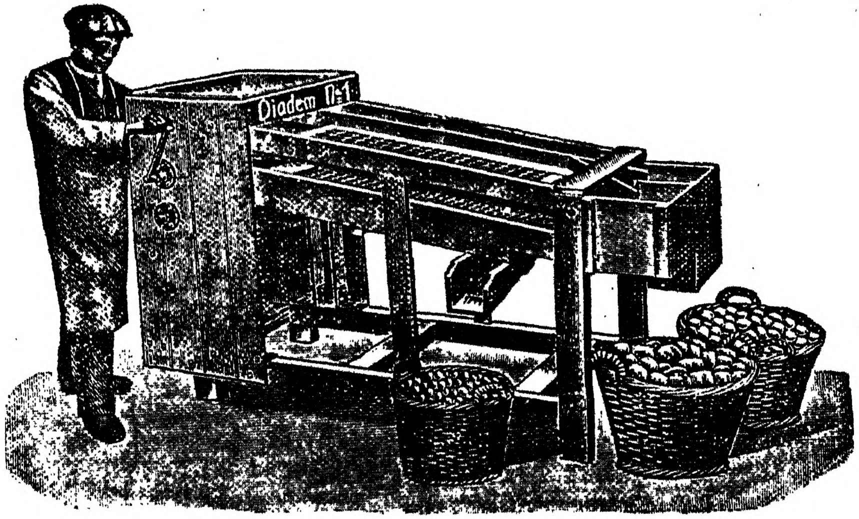
The worm shaft (*m*) is provided with a crank handle at its lower end and with a worm at its upper extremity working in a swivel nut (*o*) on the support. By causing the shaft (*m*) to rotate by means of the hand crank, the U-shaped support (*c*) turns on the shaft (*b*) and alters the inclination of the distributing disk. At the same time the worm shaft affords great stability to the support, which cannot shift by itself, and allows the disk and the gears to run smoothly.

290 - **Report of the Machine Experiment Station of the Agricultural Association of Prussian Rhineland on the Potato-sorting Machine " Diadem No. 1. "**

GIESELER, E. Prüfungsbericht der Maschinenprüfungsstation des landwirtschaftlichen Vereins für Rheinpreussen über die Kartoffelsortiermaschine, " Diadem " Nr. 1. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 9, pp. 102-103. Berlin, January 29, 1913.

The machine shown in the two annexed figures was tried twice. It is easily transportable, a strong boy can work it easily and its feed hopper is at a convenient height. Most of the earth falls before reaching the sorting sieves through a swinging screen at the back of the machine, and over a wooden gutter which at the same time protects the shaft and gearing. The riddles thus remain clean for a long time, unless the earth adhering to the potatoes is particularly sticky. The riddles are besides easy to clean and to change. Under normal conditions the machine grades about 5 tons of potatoes per hour, that is, as many as two workmen can feed to it. The potatoes fall well sorted into three grades into baskets. The construction of the machine is solid and durable, and the arrangements for lubrication are convenient.

The working of the machine is the following: By turning the crank handle a set of geared wheels transmits motion to a horizontal shaft which goes right through the wooden frame of the machine. In the middle, this shaft is bent to a crank bearing one end of a connecting rod, the other end of which is fastened to the lower screen, causing it to move forwards and backwards. The upper end of this screen is borne by two oscillating long wooden springs fixed to the lower bars of the frame, while its lower end is supported by the lower arm of a vertical lever pivoting round its centre. The upper arm of this vertical lever bears the lower end of the upper screen.



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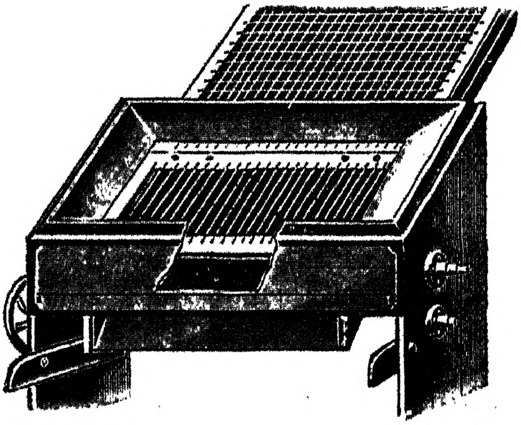

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The upper end of the upper screen is also supported by two oscillating wooden springs. By this arrangement the two screens move always in opposite directions and shocks are reciprocally neutralized.

291 - Trial of the Hand Power Separator "Lacta 2," of the Machine and Bridge-building Company, Helsingfors, Finland.

REZEK, I. and WINKLER, W. Prüfung der Handmilchzentrifuge "Lacta 2" der Maschinen- und Brückenbau- A.-G. Helsingfors, Finnland. K. k. Hochschule für Bodenkultur. Prüfungsstation für landwirtschaftliche Maschinen und Geräte. — *Oesterreichische Molkerei-Zeitung*, Year 20, No. 2, pp. 22-24. Vienna, January 15, 1913.

On the construction of the seperator under examination the following is to be noticed: The drum consists of two parts, united by a ring and rendered watertight by a rubber ring. The bottom of the drum, which is raised in the centre, ends in a hollow cylinder which receives the end of the spindle, and on which the drum rests in such a way that its centre of gravity is lower than its point of support; it can thus balance freely, while rotating, on the end of the shaft. For this object the spindle head is provided with a metal cap AC (see figs. 1 and 2) fixed to it by a pin, which causes it to revolve with the spindle, but allows it sufficient play room, while the outer surface of the cap fits tightly in the hollow space at the bottom of the drum. The central tube through which the milk is fed is placed immediately above the cylindrical part of the bottom of the drum, against which the tube ends in a foot plate with three channels by means of which the inflowing milk is led to the neutral zone. Next follow 22 metal cones placed one above the other which at the top completely enclose the central tube. The whole set of cones is pierced vertically in three points which allows the milk to ascend and to spread between the conical plates; besides which they have three smaller openings on their flattened upper edge in order to allow the cream to rise. The set of cones are at a distance of 4 millimeters from the side of the drum and are covered by a top cone which embraces the central tube by means of a strong cylindrical support, and bears on its flat edge inclined inwards two outlets for the cream, the openings of which can be regulated by means of screws. The skimmed milk issues by the three grooves in the cynlindrical support of the upper cone, which convey it over the edge of the drum cover above the upper cone, whence it flows by centrifugal force.

The bearing consists of a strong brass socket which surrounds the shaft and which in its turn is held by a strong spiral spring.

The gearing shown in fig. 3 presents two novelties for separators.

1. The usual simple spur wheels are replaced by skew wheels, which offer the advantage of diminishing friction and of working noiselessly.

2. The intermediate shaft of the drum shaft is connected with the worm gear on it by means of a spring friction coupling, and the play room of the spring against the intermediate shaft is so small that by the motion of this shaft in one or the other direction it is immediately and automatically thrown into or out of gear.

The power required to work this separator was calculated by means of an electric method and also by Leuner's spring dynamometer.

Altogether 10 tests were made with the separator, the results being tabulated in the paper. They show that working under normal conditions the amount of butter-fat remaining in the skimmed milk is only 0.09 per cent., which is a very good separation.

When the number of revolutions was diminished by about 20 per cent. the intensity of separation changed but slightly and was satisfactory also at the low milk temperatures of 20° to 23° C. (68 to 73. 4° F.), the fat content of the skimmed milk not exceeding 0.14 per cent.

The noise produced by the machine when at work is very slight. The design of the separator is simple and suitable and it is carefully constructed. It does not require any particular skill to dismount, to remount and to clean it, all of which can be done in a few minutes. In view of these results the separator was pronounced to be an excellent machine.

292 - A New Machine for the Extraction of Rubber from Bark.

JUMELLE, H. Une nouvelle machine pour l'extraction du caoutchouc des écorces. — *Le Caoutchouc et la Guttapercha*, Year 9, No. 106, pp. 6780-6783. Paris, December 15, 1912.

The extraction of rubber from bark by trituration is not to be recommended in the case of all rubber-producing trees, although it is an excellent method to apply to lianes in general and also to such trees as usually afford only small quantities of latex when tapped.

The writer describes a new machine, "la Valour," which allows of the operation being carried out more rapidly, regularly and completely than when the material is crushed by hand in mortars. The entire apparatus consists of an iron cylinder driven by some kind of motor. The necessary force is about 3 H. P. The cylinder, which is placed horizontally, is pierced with numerous holes. Inside are about fifteen strong rollers, each weighing 37½ lbs., and with a length almost equal to the cavity of the drum. These rollers are free, and when the drum moves at the approximate rate of 45 revolutions per minute, these bars of iron fall onto each other and also against the sides of the machine, acting in fact like the pestle in a mortar. If a certain quantity of bark is introduced into the cylinder it gets finely crushed. A stream of water, which passes through the perforations in the wall, removes the débris of the pulverised bark, while the pure rubber remains in the drum; it is then removed, carefully washed in hot water and formed into blocks by strong pressure. This machine can also work without water; in this case, the pulverised bark issues from the holes made in the drum for the purpose. The apparatus can be taken to pieces and thus transported on the backs of men or animals.

The cylinder is capable of containing 70 lbs. of bark. The block of rubber obtained in the course of an experiment made with the above weight of bark of *Landolphia Thollonii* represents 10 per cent. of the bark. It was of a maximum degree of purity, and only contained 1.15 per cent. of ash, which is much less than in the case of rubber obtained by tri-

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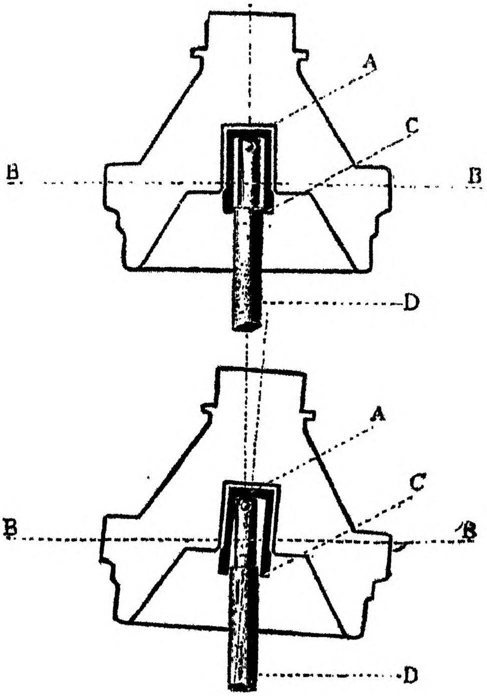
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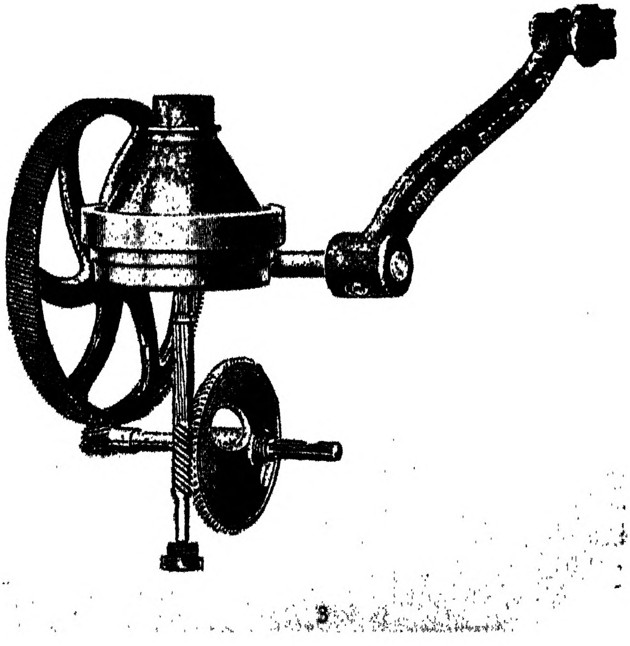

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turation, though it is a great deal more than results from the coagulation of the latex. The somewhat spongy appearance of the section of the block is due to the method of preparation and would become perceptibly less if the block were submitted to hydraulic pressure.

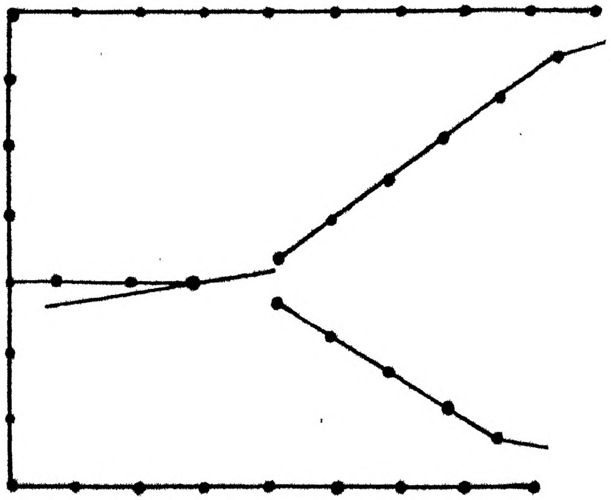
The writer considers that this machine produces in the minimum of time as fine and pure a rubber as can be obtained by trituration. This is all that can be expected, as this kind of rubber is one which can only be obtained by this direct extraction.

293 - A Cutting-Out Gate for Hogs.

BUILDING-CONSTRUCTION

KORTE, H. A. in *The Breeder's Gazette*, Vol. LXIII, No. 2 (1624), p. 79. Chicago, January 8, 1913.

As shown in the annexed figure, two wings of fence lead up to the opening for the cutting-out gate. This opening is 2 feet wide. The gate is 4 ft. wide and hangs on a post, as on a pivot, so it swings easily from side to side of the 2 foot opening. From the top of the gate a pole extends backwards about 12 feet, by which the gate is swung. It should be far enough back that as the animals approach the gate they will not be frightened by the man who stands there to work it.



This is a simple device and not expensive and has been found a great help in practical use in separating hogs.

RURAL ECONOMICS.

RURAL ECONOMICS

294 - Grazing or Stall-Feeding on High-Moor Farms.

SOBOTTA. Die Zukunft im Hochmoor, Weidewirtschaft oder Stallfütterung? — *Fühlings Landwirtschaftliche Zeitung*, Year 61, Part 24, pp. 826-852. Stuttgart, December 1912.

Owing to the good water supply on high-moors, the owner of the smallest farm in these districts has free choice in the selection and distribution of his cultivation methods and can plough the land or lay it down to grass, as best suits the size and requirements of his property. Meadow and pasture cultivation on the high-moors has made considerable progress of late years. High-moor pastures give as good a yield of grass as marsh pastures and even proved superior to the latter in the droughty year 1911. The average hay crop per acre on the high-moor meadows is reckoned at 2 tons, and the average increase of live weight of cattle on the pastures at 262 lbs. per acre. The value of the yield of an acre of meadow land is: 2 tons of hay at £3 = £6; and that of pasture land is: 262 lbs. increase of live-weight at about 5*d* = £5 5*s*. As the extra value of the hay crop is counterbalanced by the higher cost of labour, the yield of meadows and pastures is about equal; thus if the question of returns is to decide the matter, there is nothing to choose between them.

The high-moor can therefore provide grazing land as well as hay to supplement stall-feeding. Thus the high-moor farmer can turn his attention to pasturage and fattening and breeding cattle in the open, or he can stall-feed the animals, either for the butcher or for dairy purposes. He can also select a middle course combining both methods.

In order to show that the two types of farming are equally remunerative, the writer cites the examples of two farms of the Wörpedorf Highmoor Colony on the Teufelsmoor in the district of Osterholz in Hanover. These farms are numbers 42 and 33 Wörpedorf. The areas under cultivation on the two farms are divided as follows:

	Wörpedorf 42	Wörpedorf 33
	acres	acres
Arable	13 ½	14
Meadow	13 ½	18
Pasture	13	3
Total area under cultivation	40	35

Thus on W.42 the proportion between arable land, meadow and pasture is 1 : 1 : 0.95, and on W.33, 1 : 1.29 : 0.22. These figures clearly show the difference between the systems of the two farms: W.42 is a typical high-moor farm, divided equally into arable land, meadow and pasture; on W. 33 there is relatively little pasturage, so that stall-feeding is indicated for the cattle there.

A comparison of the receipts and expenditure of both farms gives further differences which result from the two systems in the sale and purchase of cattle, sale of products, purchase of foodstuffs and manure, etc.

a) *W.* 42.

Receipts.	£	s.	d.
1. 221¼ cwt. of potatoes at about 2*s.*	22	0	0
2. 61½ qts. of milk daily (carriage deducted) at 7½*d.* per gal.	172	17	6
3. 2 in-calf heifers and 2 discarded cows at £22 1*s*	88	4	0
4. 4 calves at £4 18*s.*	19	12	0
5. 80 fat pigs of 200 lbs. at about 50*s.* per cwt.	352	16	0
6. 12 700 cub. ft. of peat	88	4	0
7. Pasture rent for outside cattle	4	3	0
8. Sundries, garden, poultry, letting out vehicles.	8	16	6
Total . . .	£756	13	0

Expenditure.	£	s.	d.
1. 2 cows (substitutes) at £22 1*s.*	44	2	0
2. 90 young pigs (substitutes) at 11*s.* 9*d.*	52	17	6
3. Depreciation of 2 plough horses, worth £29 7*s.* 6*d.* each, at 10 %	5	17	6
4. *a*) Crushed barley and fodder meal	205	15	0
b) Brewer's grains	20	11	0
5. Seeds	4	17	6
6. Chemical manures	14	12	6
7. Wages :			
a) farm servant: wages £24 10*s.*; keep £19 15*s.*	44	5	0
b) day labourer: 150 days at 2*s.* 6*d.*, 150 days at 1*s.* 3*d*	27	15	0
c) maid: wages £8 16*s.* 6*d.*; keep £15 16*s.*	24	12	6
d) Piecework in turf-cutting, harvesting, and like expenses	39	5	0
8. Rent of meadow	1	0	0
9. Depreciation of buildings, worth £490, at 5 %	24	10	0
10. Depreciation and maintenance of live and dead stock	24	10	0
11. Insurance premiums, various expenses, risk.	68	12	0
Total . . .	£603	2	6

The receipts thus exceed the experditure by £153 10*s* 6*d*. If the value of the work done by the farmer and his wife is taken to be worth £53 5*s* + £26 10*s* = £ 61 15*s*, a net revenue of £91 15*s* 6*d* is gained; at 5 per cent. this represents a capital of £1835 10*s*, while the owner according to his books valued his property and his stock at £1702 7*s* 6*d*.

b) *W.* 33.

Receipts.	£	s.	d.
1. 236 cwt. of potatoes	23	10	0
2. 26 gallons of milk daily at 6¼*d.*	296	7	0
3. *a*) 4 cows at £23 10*s.*	94	0	0
b) 2 fat bullocks at £24 10*s.*	49	0	0
4. 10 calves at £4 18*s.*	49	0	0
5. 80 fat pigs at about 50*s.* per cwt.	352	16	0
6. 17 000 cub. ft. of peat	117	12	0
7. Leasing of buildings and land	9	16	0
8. Sundries, garden, poultry, letting out vehicles	8	16	0
Total . . .	£1000	17	0

Expenditure.	£	*s.*	*d.*
1. *a*) 4 in-calf cows at £24 10*s*.	98	0	0
b) 2 bullocks for fattening at £12 5*s*.	24	10	0
2. 90 young pigs at 11*s*. 9*d*.	52	17	6
3. Depreciation of 2 ploughing horses, 10 % on £58 15*s*.	5	17	6
4. Feeding stuffs	382	5	0
5. Seed	7	7	0
6. *a*) Chemical manures	4	18	0
b) Pig dung	2	9	0
7. Labour :			
a) 2 farm servants at £44 5*s*.	88	10	0
b) 1 maid	24	12	0
c) Labour for cutting peat ; harvesting, etc.	44	2	0
8. Rent of meadow	2	0	0
9. Depreciation of buildings, worth £656 10*s*., at 2 %	13	2	6
10. Depreciation and maintenance of live and dead stock	24	10	0
11. Insurance premiums, various expenses and risk	68	12	0
Total . . .	£843	12	6

These receipts thus exceed the expenditure by £157 4*s* 6*d*. If the labour of the farmer, his wife and mother are valued at £35 5*s* + £26 10*s* + £13 5*s* = £ 75, there is a net revenue of £82 4*s* 6*d*, which, at 5 per cent., represents capital to the amount of £1644 10*s*.

This comparison clearly shows that two neighbouring high-moor farms, of which the conditions are similar, can develop very differently and yet give the same results from the cultural and the financial point of view.

The simplicity of the management, the little labour required, the few agricultural risks and the relatively more certain previsions, are all factors which incite the farmer who has learnt what hard work is involved in moor farming, to imitate the marsh farmer in depending chiefly on pasture, especially since good and remunerative pasturage can be established on high-moors. The weak side of this system is less apparent. Where pasturage is the chief industry of the farm, it is very difficult to keep the cattle intended for fattening through the winter and to obtain sufficient animals to fill up the vacancies, when it is desired to use home-bred cattle, of which the disposition and qualities are well-known. To provide for these animals throughout the winter entails the purchase of large quantities of concentrated food ; this makes the profits accruing from the system very doubtful.

To these difficulties must be attributed the general division of stock-raising labour between the east and west districts in Germany. The animals bred on the western pastures — cows in calf, heifers and young cattle —, which have to be removed at the close of the grazing season, mostly find winter quarters in the eastern provinces, especially on estates where agricultural industries are carried on (distilleries, factories of starch and sugar). The landowners of the eastern provinces often find it difficult to keep sufficient cattle during the winter to utilize the waste products from the factories, as the extent of pasturage is not great; on the other hand, a farm which devoted a large area to the cultivation of fresh fodder would not be profitable.

From the standpoint of national economy, this division of labour is most important, as the production of meat is thereby regulated. The pasture farms furnish the greater part of the butcher's beasts from late summer (August) to the end of autumn, while the winter-feeding farms supply beasts from December on into summer. The annual meat supply is thus conveniently apportioned and great fluctuations in price are avoided.

During the last few years, large areas in the eastern districts have been laid down to pasture, especially in parts where extensive low-lying moors occur. Thus the east will in the near future be independent as regards obtaining young cattle and butcher's beasts in the summer. If the western districts devote themselves continually more exclusively to maintaining extensive pasture-farming, to the exclusion of stall-feeding, this will lead on the one hand to ill- timed overproduction and on the other to a rapid decrease in the supply, with the result that there will be a great disproportion between the supply and demand and much fluctuation in the prices on the cattle market. Thus from the point of view of national economy, it is necessary to determine the purpose to which the high-moors are to be put, seeing that there are still extensive moorland tracts uncultivated in Northwest Germany.

High-moors combine the most suitable conditions for grazing and for stall-feeding. They can be cultivated to raise not only cereals suitable for bread-making, but also hay and root crops sufficient to form a good basis for winter feeding. It must be remembered that a stock-raising farm can only prosper if the crops and meadows provide the whole winter fodder supply. So far, the labour question has given no trouble ; in fact as the farms are on an average only 27 acres in extent, the farmer and his family are able to do all the necessary work. In such farms under extensive cultivation, the brothers and grown-up sons of the proprietor cannot eventually find steady and remunerative work upon it and, like other members of the household will be driven to seek employment in town industries.

Purely extensive cultivation, even over large areas, can only provide food and lodging for a relatively small number of people. But a system of farming which includes tilling arable land and keeping cattle in the open and the stall, better promotes the circulation of large quantities of articles of food (grain, potatoes, milk, meat) than a system which is based upon grazing and where the whole aim is limited to the production of meat.

From what has been said, it is evident that the best way of cultivating high-moors is to divide them equally and systematically into arable fields, meadows and pastures.

295 - The Profitableness of Artificial Manuring.

Die Rentabilität der Kunstdüngung. — *Land- und volkswirtschaftliche Mitteilungen*, Year XXXI, No. 2, pp. 19-20. Linz, January 15, 1913.

The bookkeeping and farm department of the German section of the agricultural council of the Margravate of Moravia, under the direction of

Dr. Ostermayr, has, by means of careful bookkeeping in a number of Moravian peasant farms, established the profitableness of using artificials. For this purpose the farms were divided into five groups:

Group I. Farms which use nitrogenous, phosphatic and potash manures.

Group II. Farms which use nitrogenous and phosphatic manures but no potash.

Group III. Farms which use phosphatic and potash manures but no nitrogenous manures.

Group IV. Farms which use only phosphatic manures.

Group V. Farms which do not use artificials at all.

Complete manuring exerted the greatest influence on cereals. The heaviest crop was 1568 ½ lbs. (26.1 bushels per acre), and it belonged to group I. From group I to group V the amount of crop harvested diminished steadily. Among cereals, rye and oats followed regularly this order, while the heaviest wheat crop was met with in group IV (exclusively phosphatic manure), and the heaviest barley crop in group II (phosphorie acid and nitrogen). It follows that rye and oats have by far the greatest need of plant food, while wheat and barley, which occupy a better place in the rotation in regard to dressings of dung, and, owring to their requirements, are grown on better soil, show less sensibility to the action of artificials.

The fact that the lowest returns per acre are recorded in group V, the one without artificials at all, proves that the use of artificials is a determining factor in the increase of returns. A comparison with group IV shows that it is especially a question of the supply of phosphoric acid. Dr. Ostermayr believes accordingly that the intensive use of this plant food can be unhesitatingly recommended to every Moravian farmer.

The net returns per acre were as follows:

Farms that did not use phosphoric acid	£1 15*s* 8*d*
" " " " nitrogen	£2 8*s* 2*d*
" " " " potash	£2 15*s* 6*d*

Consequently the least reliable in their effects on the increase of net returns are the potash manures.

Dr. Ostermayr also grouped the farms according to the quantities of the various artificials employed, and found that an increased consumption of nitrogen and phosphoric acid has the effect of increasing the net returns, but that the reverse is the case with potash manures: the more considerable the quantity of potash given, the lower the net returns. From this observation it does not follow that manuring with potash is never attended by success, but that the most advantageous quantities of manures to be employed, and especially of potash manures, must be determined in each farm by means of careful experiment.

296 – Cost of Making Beef.

The Breeder's Gazette, Vol. LXIII, No. 2 (1624), p. 81. Chicago, January 8, 1913.

The lot of oxen which was exhibited at the International Exhibition of 1912 in the short-fed class and won championship honours were treated as follows:

On Feb. 3, 1912 these cattle, weighing 950 lbs. each, were purchased at $ 5.25 per 100 lb. and were fed no grain before August 12. From February 3 to April 10 the feed consisted of rather coarse timothy hay and the fodder taken from about 2 ½ acres of corn. On April 7 the cattle were turned on 60 acres of good bluegrass pasture with a good deal of old grass left from the previous season. Here they remained without any additional roughage until August 12. Two snow storms during April made it necessary to bring the cattle up to feed for a few days. On August 12, after twelve hours off feed and water the eighteen steers averaged 1 208 lbs., showing a gain of 258 lbs., since February 3. During the first 60 days of the feeding period, the cattle had access to 40 acres of pasture from which a crop crop of hay had been taken, and the grain consisted of cracked corn, spelt and oil meal. A full feed was reached in about two weeks and practically no steers went off feed. If they showed an inclination to loss of appetite, molasses feed was added to the ration. The gradual change from old to new corn commenced on September 16. During the last thirty days, the cattle received 5 ½ lbs. of oil meal per head per day.

Complete figures follow.

Cost up to August 12.		
18 steers, av. 950 lbs. at $5.25	$	897.84
2 ½ acres corn fodder at $20 per acre	”	50.00
10 tons hay at $10 per ton.	”	100.00
60 acres pasture at $4 per acre	”	240.00
Interest on investment at 6 per cent.	”	53.87
Total . . .	$	1 341.71
Feed bill August 12 *to November* 30.		
52 bu. spelt at 30 c. per bu.	$	15.60
4 tons oil meal at $33.50 per ton.	”	134.00
335 bu. cracked corn at 75 c. per bu.	”	251.63
587 bu. new corn at 40 c. per bu.	”	234.90
1 ½ ton molasses feed at $26.50	”	39.75
Pasture, August 12 to October 10	”	20.00
1 ton alfalfa hay at $16 per ton.	”	16.00
Corn stover	”	10.00
Total cost to November 30 . . .	$	2 063.59
Proceeds.		
15 steers, 22860 lbs. at $10.70	$	2 446.02
3 steers, 4 660 lbs at $10.75	”	500.95
Total . . .	$	2 946.97
Commissions and charges . . .		131.00
Net proceeds	$	2 815.97
Premium won	”	300.00
Total . . .	$	3 115.97
Cost	”	2 063.59
Net profit . . .	$	1 052.38

207 – **Land Valuation.**

EICHHOLTZ, TH. Bodenschätzung. — *Deutsche Landwirtschaftliche Presse*, Year XXXX, No. 7, pp. 73-74; No. 8, pp. 83-84. Berlin, January 22 and 25, 1913.

After a short explanation of the terms: value based on net returns, farming value and common value of land, and of the connection between them, the writer discusses the question of valuation in the rounding up of estates by exchange (Zusammenlegungsverfahren). The general commissions still practise the exchange of pieces of land in the rounding up of properties according to the values based on returns. According to the writer the chemical properties of the soil and the distance from the farm houses do not receive sufficient consideration from this method of valuation. A further inconvenience is that complaints against the distribution of the pieces of land are again judged according to the same principles which gave rise to the complaints.

These evils could easily be avoided if the soil were examined according to the geologico-agricultural maps and if the market value were considered as the measure of value in these exchanges. This latter would contain in itself the distance, the position, the agricultural and technical possibilities, and all the other properties of the soil that determine its value.

The valuation of land must take into consideration two principal factors, namely that the agricultural value of the new pieces of land should be in just proportion to that of the old ones, and secondly that the personal property of the owner, expressed in common value, should suffer no loss.

According to the data furnished by the chief land surveyor Ammon in the third report (1912) of the Bavarian Flurbereinigungskommission, the most desirable land valuation, from a theoretical point of view, would be the one which would contain in one single number all the factors which determine the current value of the piece of land, in just proportion to all the other pieces in the region undergoing the rounding off of properties by means of the exchange of outlying fields. A valuation in figures which omits any factor determining the value and does not consider it in some other way in the exchange of fields, cannot satisfy the condition that every one who takes part in these exchanges must receive full compensation for the land he gives up.

If use is made of the market value in such valuations, it is obvious that the same market value cannot be used throughout the whole operation, for with the new arrangement a new market value arises. This value is called by the writer the transition value. This transition value, even after deduction of the contributious for works made in the common interest, such as roads, ditches, etc., will be higher than the original value of the old field. As this difference in value is divided equally among all who take part in this exchange, which with the present way of proceeding is the case only to a small extent, the equity of the method will be recognised by the landowners and their confidence in it will increase. It is only this method, allowing the increase in the value of the land to be expressed in figures, which can give a just measure for the division of the cost of the operation.

In valuing according to the market value, it is to be noted that the market value V consists of the product of the geological-agricultural-geographical value G, by the factor of the vicinity to the farm buildings N, and by the farming power of the owner, O; therefore:

$$V = G \times N \times O; \text{ and } G \times O = \frac{V}{N}$$

In purely agricultural districts O, (excepting on leased lands) may be considered as almost everywhere having a constant value. Where, however, industrial influences or the neighbourhoad of building sites act upon the value of the soil, a new factor I appears; consequently $V = G \times N \times O \times I$, and in plotting the values on the maps the influence of the factor I will show in belts about the value $G \times N \times O$. The determination of these belts is very important, both for the rounding up of properties and for expropriations. By means of this method, the value of the influence of industrial centres I may be calculated, as $I = \frac{V}{G \times N \times O}$; and with the help of this the difference between the industrial and the purely agricultural value of the plots of land is found.

In determining the market value of land, in spite of the abundance of available material for comparisons, errors can easily be committed: but they are not errors of principle like those which are committed in the valuation according to returns and which will be repeated by the commission of appeal following the same principles, which the landowners do not under stand. The errors which may be made by the first method are such as are easily recognized by the landowners, and it therefore seems advisable to adopt everywhere the valuation made by the owners themselves.

If, in taxing agricultural land, its market value were taken as a basis, a good deal of inconvenience would arise: where for instance the industrial factor I has considerably increased the value of land, farming would no longer be able to pay the interest upon it, and under certain conditions would cease altogether. In order to remedy this inconvenience, the factor I can be calculated and subtracted from the market value. The purely agricultural value would thus be obtained and this only should be conditionally taxed. The exemption from taxes on the value I ought to be entered in the land register, under the condition that the difference in the tax will be paid with compound interest by the land owner or his heirs when the land in question is be built over or used for industrial purposes. In this way valuation according to market value would not increase the burthen of taxation on farms, but would be a bar to unwholesome speculation and a protection to agriculture and to public health in the neighbourhood of towns and of industrial centres.

The writer expresses the wish that in the new valuations for taxation, the market value of an extensive purely agricultural district be ascertained as well as the present sum of taxes on returns for the same area. This latter sum should then be distributed according to the market value, so that the total burthen would not change but be better distributed.

The agricultural improvements carried out by owners should not be taxed until the land changes hands. The sites of buildings and the house gardens should pay land-tax and not house-tax.

The application of valuation according to this system requires on the part of the State geologico-agricultural examinations of the soil on an extensive scale, as well as the determination and control of the valuation itself. This ought to be the duty of the valuation division of the land office which the writer desires to see established.

AGRICULTURAL INDUSTRIES.

DAIRYING

298 - Variations in the Composition of Whole Milk used in Cheese Making.

KOSTLER, G. Schwankungen in der Zusammensetzung ganzer Käsereimilchen. — *Schweizerische Milchzeitung*, Year 39, No. 9, p. 1. Schaffhausen, January 1913.

In dairies, where milk from various sources is used, adulteration of the collected milk may occur, and is very difficult to prove scientifically on account of the large quantities dealt with. If, for instance, 10 lbs. of 25 per cent. cream are taken from 1000 lbs. of milk, the fat content is only decreased about 0.2 per cent. The question is now whether a difference of 0.2 per cent. in the fat content of collected milk is a normal variation or not. To find an answer to this query the writer has investigated the composition of the milk used at two cheese dairies every day for a fortnight. The results are given in the following table:

Milk A (1). Morning-milk				Milk B (2). Evening-milk			
January 1913	Fat %	Total solids %	Solids not fat %	January 1913	Fat %	Total solids %	Solids not fat %
4	3.70	12.87	9.17	5	3.79	13.00	9.21
6	3.69	12.91	9.22	7	3.86	13.01	9.15
8	3.62	12.78	9.16	9	3.79	12.88	9.09
10	3.74	12.79	9.05	11	3.78	12.90	9.12
12	3.88	13.04	9.16	13	3.82	12.99	9.17
14	3.79	12.98	9.19	15	3.79	12.83	9.04
16	3.74	12.79	9.05	17	3.77	12.85	9.08

(1) From 11 farmers with 150 cows.
(2) From 28 farmers with 200 cows.

The specific gravity at 15° C. varies from 1.0319 to 1.0329.

Conclusions. — A difference of 0.2 per cent. in the fat content of upwards of 200 gallons of mixed milk is suspicious; variations less than this, considering the taking of the samples, cannot be taken to show that any cream has been removed.

299 - The Preservation of Milk Samples for Analysis.

Denigès, G. La conservation des échantillons de lait destinés à l'analyse. — *Annales des Falsifications*, Year 5, No. 50, pp. 559-561. Paris, December 1912.

The most effective chemical for preserving milk is carbolic acid; 50 gr. of this are disssolved in 10 cc. of a 95 per cent. solution of alcohol, and 1 cc. of this mixture suffices to preserve 100 cc. of milk. The composition of the milk can be tested in the usual manner as well after this addition as before. Experiments on this subject were made by the writer and M. Dubois with the following results:

Milk No 1.

	Fresh milk (April 20)	Same milk + carbolic acid (May 25)
	gr. per litre	gr. per litre
Acidity	2.70	2.70
Milk sugar	47.49	47.45
Fat	30	30
Casein	32	32
Ash	6.3	6.80
Solids	120.5	120

Milk No. 2.

	Fresh milk (May 17)	Same milk + carbolic acid (June 3)
	gr. per litre	gr. per litre
Acidity	1.80	1.80
Milk sugar	46.85	46.80
Fat	38.12	38.10
Casein	32	32
Ash	6.80	6.80
Solids.	126	126

Milk No. 3.

This milk was investigated fresh in 1900, then preserved with carbolic acid and analysed 10 years later. Its composition was as follows:

	1910	1900
	gr. per litre	gr. per litre
Acidity	1.85	1.80
Milk sugar (anhydride)	46.40	46.85
Fat	37.90	38.12
Casein	32	32
Ash	6.75	6.80
Solids	126.40	126

300 – A Biological Method of Testing the Quality of Milk,

PARASCHTSCHUK, S. Biologische Untersuchungsmethode für die Güte der Milch. — *Milchwirtschaftliches Zentralblatt*, Year 42, Part 3, pp. 65-69. Hannover, February 1, 1913.

The species of lactic acid bacteria present in milk vary according to its quality. The time which is required to coagulate milk and the characteristics of the coagulum differ according to the species of bacteria present; the writer has made use of the different physiological behaviour of the lactic acid bacteria for determining the quality of milk, employing the following species: Danish *Streptococcus*, Jaroslav *Diplococcus*, *Bact. Güntheri*, Russian *Streptococcus* and *Bac. bulgaricus*.

The investigations were carried out in the following manner: the milk was first sterilized and then inoculated with 1 to 2 per cent. liquid cultures (in which each species was equally represented) and placed in a thermostat at a temperature of 32° to 36° C.

The time needed for coagulation was registered and the bacteria present were examined and were as follows:

Milk	Coagulation time	Quality of coagulum	Preponderant species of bacteria
Very good	5-6 hours	fine and of good flavour	Danish *Streptococcus*, Jaroslav *Diplococcus*, *Bact. Güntheri*.
Good-average. . .	5-7 hours	thinner, flavour good	Jaroslav *Diplococcus*, *Bact. Güntheri*, Russian *Streptococcus*.
Bad.	More than 8 hours	tenacious	Russian *Streptococcus*, *Bact. bulgaricus*.

301 – Whey Lemonade.

BURRI, R. Die Molkenlimonade. — *Molkerei-Zeitung*, Year 27, No. 5, pp. 81-82. Hildesheim, January 17, 1913.

The latest product of the milk industry is "whey lemonade" made by Sterli of Basle from cheese-factory whey, which is poor in protein. (Application for patent is announced). This liquid, which is perfectly clear and keeps for several weeks, is of a greenish colour, but this is lost if the bottles are kept exposed to the light. The gas consists of small vesicles, as is the case with ordinary lemonade, and the taste slightly resembles that of milk which has been a little overheated (boiled taste).

The chemical composition of the beverage varies according to the whey (acid or rennet whey) and the method of cheese manufacture. In addition to the milk constituents (milk salts, sugar and acids), cane sugar is also present, as well as the carbonic acid introduced by pressure. Samples examined by Dr. Köstler-Rütti and the writer show the following proportions:

1. Acidity after removal of the carbonic acid	18.2 — 28.6 %
2. Nitrogen as protein	0.2 %
3. Cane sugar	5.8 — 5.9 %
4. Milk sugar	1.37 — 3.29 %
5. Ash	0.47 — 0.64 %
a) Lime, CaO	10.5 — 23.79 %
b) Phosphoric acid P_2O_5	15.52 — 18.8 %

The nutritive value of whey lemonade is higher than that of essence lemonade ; it also renders unnecessary the use of expensive sour milk preparations (yoghurt) in combatting inflammation of the intestines. When pasteurized, this lemonade is germ-free and is especially suitable for milk cures.

When whey is cheap and lemonade dear, the manufacture of whey lemonade promises to be a lucrative subordinate industry, especially in the case of city dairies where cheese is made.

302 - The Determination of the Water Content in Cheese.

NOCKMANN, ELSE. Zur Bestimmung des Wassergehaltes im Käse. Mitteilung aus dem chemischen Untersuchungsamt der Stadt Breslau. — *Molkerei-Zeitung*, Year 27, No. 2, pp. 1-2. Hildesheim, January 8, 1913.

Hitherto the amount of water in cheese has been determined either by drying the latter over sand, or by direct desiccation in a platinum vessel. As the two methods give the same results, the writer gives the latter the preference on account of its greater simplicity.

Another process was recommended by L. Mai and E. Rheinberger on the occasion of the chief meeting of the Union of German Food-Analysts. This was based on the principle of estimating the water by distillation with a liquid boiling at above 100°C., which does not mix with the water and thus allows of the direct estimation of the amount of the latter distilled. Petroleum is recommended as the most suitable distillation substance.

The writer has tried this new method on 20 different samples of cheese and compared it with the desiccating process in the platinum dish. She made triplicate estimations in both cases. The apparatus used in the distillation was that designed by L. Mai and supplied by Lautenschläger of Munich.

Results. — The estimation of the water by distillation was carried out in duplicate, and the determinations were on the average closely concordant. There were, however, some isolated cases where great differences were observed, as 0.52 per cent. in the case of a Swiss cheese and 0.57 per cent. for a Harz cheese. This may, however, be due to the difficulty in obtaining a homogeneous average sample of Harz cheese, as well as to the usual methods employed in making many cheeses. A comparison of the averages obtained by both methods showed that somewhat higher figures were obtained by distillation. Further tests were made with the idea that water might also be present in the petroleum, but there was no difference in the results. In a third of the samples tested, the difference between the two methods was less than 0.5 per cent., that is below the limit of error allowed in duplicate determinations, and in the case of nine samples, the difference was less than 1 per cent. The highest deviation was shown by Swiss cheese, being 1.87 per cent. It was particularly stored, ripe kinds of cheese which showed the differences with the different methods. This is possibly due to the formation, during keeping and ripening, of many volatile substances capable of distillation at high temperatures. It may also be that this cheese, on account of its stiff consistency, does not part with all its water when dried in the oven.

Summary. — The distillation method deserves preference from taking less time. It is also easy to carry out and saves weighing. As, however, not inconsiderable differences may arise from the use of the two methods, it is necessary, in order to obtain uniform results at all experimental stations, that one or other should be officially adopted.

MEAT INDUSTRY

303 - A Contribution to the Question of the Physiological Occurrence of Bacteria in Sound Meat.

GRUNT, OTTOKAR. Beitrag zur Frage des physiologischen Vorkommens von Bakterien im Fleische gesunder Schlachtrinder. — *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 9, pp. 193-207. Berlin, February 1, 1913.

The writer reviews the investigations of other experimenters respecting the germ content of meat and then describes his own work on this subject, which he undertook for the purpose of finding further principles for the bacteriological inspection of meat in slaughterhouses. He found amongst other things that bacteria placed on the outside of the meat very quickly penetrated into it. This he attributes to the mechanical effect of the meat (pressure), which either directly causes the entrance of the bacteria, or brings it about indirectly by the expression of the meat-juice, which, on the cessation of pressure, is drawn into the meat again, taking the bacteria with it.

The results of the work are as follows :

1. In the flesh of sound slaughtered animals no bacteria occur physiologically.
2. As in practice outside infection of the meat is unavoidable, meat destined for consumption necessarily contains a certain number of germs.
3. To prove conclusively the presence of bacteria in meat, it is necessary to examine larger pieces (if possible enclosed in connective tissue), and to allow of the development of any microorganisms present, which necessitates the use of incubators.
4. The postmortem entrance of bacteria into the interior of the meat follows, especially after any mechanical injury, so quickly that surface sterilization is generally too late.
5. In contradistinction to the flesh, the lymphatic vessels of sound cattle often contain bacteria.

304 - The Pork Trade in the Argentine.

RICHELET, JUAN E. Decadencia de la industria de preparados porcinos. — *Revista de la Asociación rural del Uruguay*, Year XLI, No. 11, pp. 806-810. Montevideo, November 1912.

In the Argentine Republic about 10 million acres of land are annually sown to maize and their production is upwards of 8 million tons; this and a portion of its great production of wheat, oats, and linseed might be devoted to the raising and fattening of live stock, and altogether the conditions for pig breeding and the pork industry seem very favourable. Nevertheless, the former is carried on to a very limited extent and several attempts made to establish the latter have failed.

The writer examines the causes of these failures and suggests remedies, among which he places the better utilization of the offals.

Since 1900 the importation into the Argentine of prepared pork has constantly increased, whilst the exportation has diminished, and in 1912 it was almost nil. The figures in the annexed table are taken from the national statistics.

The value of the imports of pig products reached £140 331 in 1911, as compared with £104 093 in 1910.

	Quantities		Values			
	1911	Difference compared with 1910	1911		Difference compared with 1910	
Importation:	lbs.	lbs.	£	s	£	s
Salt pork	2 141	+ 963	24	10	+ 172	11
Canned pork	415 441	+ 89 694	18 687	3	+ 4 034	9
Sausages	697 778	+ 7 828	44 362	16	+ 743	1
Hams	1 671 598	+ 33 384	75 191	8	+ 15 385	2
Bacon	20 027	+ 8 320	720	15	+ 182	16
Lard	74 388	+ 22 154	1 338	11	+ 398	13
Exportation:						
Live pigs	—	—	17	17	+ 11	18
Cold-stored pork	2 227	— 2 227	—	—	— 29	19
Bacon	—	— 38 757	—	—	— 1 478	0
Lard	17 877	— 17 773	321	17	— 319	10
Bristles	69 714	+ 58 691	250	18	+ 211	5

OOL
DUSTRY

305 - Wool from Cyprus.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 537-539. London, December 1912.

Sheep-raising is an important industry in Cyprus, large numbers of sheep being killed annually for local consumption; the wool produced is exportted chiefly to France and Italy. The exports of wool were 4851 cwt., valued at £11 216, in 1909, and 6596 cwt., valued at £15 203, in 1910. (No further statistics are available). The total number of sheep in the Island in 1910 was about 400 000 (1). The wool is of inferior quality; this is partly due to the breed and partly to the conditions under which the sheep are kept. Attempts have been made by the Agricultural Department to impress on the native breeders the necessity of keeping the sheep well fed, and experiments have been carried out at the Athalassa Experimental Farm for the purpose of demonstrating the advantages of careful rearing. In the annexed chart are enumerated the results of the examination — at the Imperial Institute of London — of the shoulder wool of two fleeces — a yearling ram (No. 1) and a yearling ewe (No. 2) — received from the Athalassa Farm. The experts stated that the fleeces represented an excellent class of carpet wool, and valued No. 1 at 9*d.* per lb. and No. 2 at 8*d.* to 8½*d.* per lb. in London (May 1912).

Chemical characters

	No. 1 %	No. 2 %
Moisture	10.9	10.3
Grease	1.0	1.8
Matter soluble in water	2.1	3.3
Matter insoluble in water	1.2	3.2
Pure wool fibre . .	84.4	81.1

Physical characters

		No. 1 —	No. 2 —
Average tensile strength gr.		36	52
Average elongation before breaking . .	%	36.8	39.8
Length of fibres * . .	in.	1-18	1-18
Diameter fibres. . .	in.	0.0019-0.0040	0.0016-0.0035
Average diameter . .		0.0024	0,0025

* These figures represent the range of length in the fibres over the whole fleece.

SUGAR
NDUSTRY

306 - The International Commission for Uniform Methods of Sugar Analysis in the Meeting held at New York on September 10, 1912.

WIECHMANN, F. G. in *The International Sugar Journal*, Vol. XV, No. 69, pp. 7-9. Altrincham, England, January 1913.

In the meeting held at New York on September 10, 1912 the International Commission for Uniform Methods of Sugar Analysis again expressed its opinion that "the official polarizations of raw sugar products shall be made exclusively at the normal temperature of 20° C., the presence of invert sugar and other impurities precluding the use of formulae and tables which have been elaborated for correcting the polarization of pure sucrose for changes of temperature."

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(1) In 1909, 301 699 sheep and 277 357 goats. — *The Statesman's Yearbook for* 1912, p. 115. London. (*Ed.*).

The wish was expressed that "the various countries may prescribe a uniform temperature for the density determinations of sugar solutions."

"In trade analyses the use of temperature correction tables should be dispensed with, as far as possible."

The following resolutions were also adopted:

"The normal temperature of + 20° C. is to be retained for trade analyses.

"In density determinations of aqueous sugar solutions, the density obtained at normal temperature shall be referred to the density of water at + 4°C. and to vacuo."

"In density determinations made by weighing, the results must be calculated to $\frac{20}{4}$°C. and to vacuo. To effect this it will be desirable to use tables prepared for this purpose."

M. Saillard, the French delegate, agreed to the latter part of the resolution, provided that in France the normal temperature there customary, namely $\frac{15}{4}$ °C., be retained in place of $\frac{20}{4}$°C.

"Wherever white light is used in polarimetric determinations, the same must be filtered through a solution of potassium dichromate of such a concentration that the percentage content of the solution multiplied by the length of the column of the solution in centimetres is equal to nine."

"Inasmuch as recent investigations tend to question the validity of the present 100° point of saccharimeters, and inasmuch as it is desirable that the Commission recognize and fix a transformation factor from absolute degrees to Ventzke degrees, the President is hereby empowered to appoint a committee of three to fully investigate this question and report at the next official meeting."

307 - Bacteria in Grape and Fruit Wines and the Alterations due to them.

WINE-MAKING

MÜLLER-THURGAU and OSTERWALDEN. A. Die Bakterien im Wein und Obstwein und die dadurch verursachten Veränderungen. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 36, No. 6-14, pp. 129-338. Jena, December 28, 1912.

The writers give in Chapter I of their very exhaustive work a short description of the bacteria occurring in wine; after which follows a description of the diseases and alterations of wine which are caused by bacteria.

In Chapter II the methods followed by the writers in cultivating pure strains of bacteria are described. As solid culture medium gelatine or agar-agar was used and as culture liquids several kinds of pear juices as well as grape juice. During the last ten years mostly extract of yeast (100 grams of pressed yeast to 1 litre of water) with the addition of about one per thousand of malic or tartaric acid and 2 to 3 per cent. of cane sugar, levulose or dextrose were added.

Chapter III contains an accurate description (Morphology, Physiology, Classification) of the pure cultures of bacteria grown by the writers. These all of them belong to the lactic acid bacteria; they are divided into four kinds: *a*) *Bacterium mannitopeum* (several strains); *b*) *Bacterium gracile* (several strains); *c*) *Micrococcus acidovorax*; *d*) *Micrococcus variococcus*.

Bacterium mannitopeum Müller-Thurgau, is found in great numbers in fruit and grape wines containing lactic acid. It forms short rods and shorter or longer septate and non-septate threads. The short rods are rounded at the extremities, 1.5 μ in length and varying in diameter between 0.7 and 1.3 μ, rarely outside these limits. The single rods do not show any spontaneous movements and do not form spores. In juices and wines the bacteria often form large tufts composed of long very much tangled threads. In wines of a certain composition zoogloeæ are often formed; they are spherical bodies in whch the single bacteria are often no longer easily to be distinguished, being firmly attached to each other by means of an intervening substance. These zooglœæ may become bladder-like aggregates of bacteria. These bacteria do not liquefy gelatine. Colonies deep in the gelatine are of round, spherical shape, smooth; superficial colonies are roundish, with very ragged margins. Gram positive. Facultatively anærobic. They cause energetic fermentation of levulose, dextrose and galactose, with productior of much lactic, acetic and carbonic acids, as well as mannite from the first-named substance and ethyl alcohol from the other two. They further cause fermentation of saccharose, maltose, raffinose, *l*-arabinose, xylose, *a*-methylglucoside and amygdalin, but not of lactose, rhamnose, phloridzin, mannite, dextrin and peptone. They destroy malic acid, but slowly, citric acid in small quantities; fairly energetically acid ammonium malate, tartaric acid and its salts, succinic acid and lactic acid. Optimum temperature: between 26 and 34° C. They form strains which differ from each other in the diameters of the bacteria and in the energy of the lactic and mannitic fermentation.

Bacterium gracile Müller-Thurgau is found in grape and fruit wines containing lactic acid, as well as in those which have suffered a destruction of their acid content. These bacteria form short rods, and longer or shorter, often strongly bent, septate threads. The rods are 0.75 to 1 μ in length and their fairly constant diameter is 0.5 μ. No spores and no spontaneous motion. They seldom form tufts and then only small ones, that is small tangles of threads; they also form zooglœæ and bladder-like aggregates. They do not liquefy gelatine. Colonies deep in the gelatine are spherical and smooth. Superficial colonies have entire margins. Gram positive. Facultatively anærobic. They cause fermentation of levulose, dextrose and galactose, with production of much lactic, acetic and carbonic acids, forming mannite from levulose and ethyl alcohol from the other two bodies. They do not induce fermentation in saccharose, lactose, maltose, raffinose, *l*-arabinose, xylose, rhamnose, phloridzin, mannite, dextrin or Witte's peptone, but do so in *a*-methylglucoside and to a certain extent in amygdalin. They decompose energetically malic and citric acids and calcium malate; with less energy neutral potassium malate and ammonium malate. Tartaric acid and its salts are not attacked, nor are succinic and lactic acids. Optimum temperatures between 22 and 26° C. They form strains which differ less in the dimensions of the rods than in the energy of the fermentation they set up.

Micrococcus acidovorax n. sp. is fund in wines in which destruction of acids is taking place, also mixed with other causes of infection in diseased wines. It forms single cocci, diplococci and tetrads (merismopedian aggregates). Single cocci 0.5 to 0.7 µ diameter. They form zoogloeæ and bladder-like groups in wines of certain compositions. The cocci show no spontaneous movement and form no spores. They do not liquefy gelatine. Colonies deep in gelatine are of spherical shape and smooth. Superficial colonies are rounded and their edges entire. Gram positive. Facultatively anaerobic. They produce only lactic acid and decompose dextrose, levulose, galactose, lactose and maltose, producing much lactic acid without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, raffinose, *l*-arabinose, xylose, rhamnose, *a*-methylglucoside, amygdalin, phloridzin, mannite, dextrose or Witte's peptone. They decompose malic acid energetically, forming lactic and carbonic acids, and also decompose neutral calcium malate and neutral ammonium malate. They do not cause the fermentation of tartaric acid and its salts nor of citric, succinic, and lactic acids. Optimum temperature : 26.5° C.

Micrococcus variococcus n. sp. is found, for instance, in red and white wines in which destruction of the acid content is going on ("siedende Weine"). They form cocci, diplococci and tetrads (merismopedian aggregates). The diameter of the single cocci varies considerably, from 0.6 to 1.5 µ. In wines of certain composition they form zoogloeæ. The cocci have no spontaneous movement and do not form spores. They do not liquefy gelatine. Deep colonies in gelatine are spherical and smooth ; superficial colonies have entire margins. Gram positive. Facultatively anærobic. They produce only lactic acid, but with less energy than *Micrococcus acidovorax* ; they decompose levulose, dextrose and galactose, with formation of lactic acid and without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, lactose, maltose, raffinose, *l*-arabinose, xylose, rhamnose, phloridzin, mannite, dextrin or Witte's peptone, but do so in the case of *a*-methylukosid and abundantly in the case of amygdalin, producing with the latter oil of bitter almonds. They cause active fermentation of malic acid, neutral potassium and ammonium malates and acid calcium malate, but not of tartaric acid and its salts, nor of citric, succinic and lactic acids. Optimum temperature : 26.5° C. They form strains which differ in the energy of their fermentative properties.

Considering the unsettled state which still prevails in the systematic classification of bacteria, it is difficult to class correctly the above-described species.

In Chapter IV the alterations in wine are discussed in the light of the results obtained with cultures of bacteria.

a) The simple destruction of acidity by the agency of bacteria, without the production of volatile acids or other unfavourable by-products is not to be considered as a disease of wines, since it increases the value of wines very rich in acids. It is just on this kind of destruction of acidity that very few data are found in the works of French investigators; they speak of "*tourne*" and "*pousse*" and mean by these terms a morbid alteration of wines. While according to the writers "pousse" implies several alterations of wine caused by bacteria and accompanied by the formation of carbonic acid. This "pousse" can appear together with the simple destruction of acidity, with the formation of lactic acid and with "tourne." Under "tourne" the writers understand only the *consequences of the destruction of acidity in wines that are poor in acids.*

The destruction of acidity is not caused by ferments but by bacteria, namely *Bacterium gracile* or species of *Microccus* (*Micrococcus malolactious* Seifert, M. *acidovorax* and *M. variococcus*). Cool cellarage, early racking from the lees, the addition of potassium metasulphite to the wine or the fumes of burning sulphur delay the destruction of acidity, which can also be prevented by the addition of acids. Malic acid as an addition is too expensive; besides, some bacteria destroy this acid also, as well as citric acid. As the most suitable the writers recommend tartaric acid. Tannin also reduces the destruction of acidity. Fining cannot be considered as an efficient remedy, as it does not rid the wine of the bacteria which cause the mischief.

Where a diminution of acidity is desirable, it can be favoured by the omission of some of the above-mentioned preventive processes. Whether the reduction of acidity may be promoted by the addition of cultures of bacteria must be ascertained by further experiments.

b) Acidity due to lactic acid occurs in fruit wines that are deficient in acidity and in mild grape wines; it is detected by a sour sweetish, somewhat acid taste and an odour recalling sauerkraut. The principal symptom of sourness due to lactic acid is the decomposition of sugar, accompanied by the production of lactic acid and much volatile acid. With this, as a rule, the destruction of malic acid and frequently a mannitic fermentation are connected, though the quantity of mannite that is formed depends essentially upon the temperature and upon the extent to which alcoholic fermentation had proceeded when the disease made its appearance. In French literature no special term is found for the sourness due to lactic acid, it being considered by French investigators together with mannitic fermentation and "tourne." The writers consider the sourness due to lactic acid and mannitic fermentation as two distinct diseases, with the reserve that with the latter the former is always connected, while lactic acid sourness can appear alone. In the writers' experiments, *Bacterium mannitopeum* was almost always the cause of lactic acid sourness; only exceptionally could it be attributed to *Bacterium gracile.* A high content of acidity or of tannin or a moderate amount of both together can prevent lactic acid sourness. Very low temperature during fermentation can also act as a preventive, though with low acid and tannin content even a slight degree of warmth is sufficient to originate lactic acid sourness. Early racking from the lees is a preventive of the disease when it is connected with an average acid and tannin content and moderate temperature. It behaves similarly with the use of sulphurous acid. The employment of pure ferments is also a protection to a certain extent against lactic acid sourness.

c) The " mousiness " (smell and laste of acetamide) according to experiments by the writers, appears to be due to *Bacterium mannitopeum.* These bacteria multiply chiefly in liquids containing sugar ; consequently this taste appears in refermented wines to which sugar solutions have been added.

d) The turning ("tourne") of wines has already been mentioned above. The writers abstain from giving a definition of this direase, as their investigations on it are not yet sufficiently advanced. They do not affirm that turning is *always* a consequence of the destruction of acidity, but they conclude from the results of their investigations on diseased wines that the two phenomena are intimately connected.

In Chapter V the writers give advice on the analyses of wines, and recommend not only the determination of the amount of lactic acid but also investigation of its origin by means of bacteriological examination. It is true that all the bacteria that the writers describe are producers of lactic acid, but their power of producing this acid is various.

Wines containing only small quantities of lactic acid and of volatile acids are generally sound.

In wines containing much lactic acid and little volatile acids a destruction of acidity has, as a rule, taken place. Examination under the microscope can reveal what kind of bacteria have taken part in the process ; most frequently *Bacterium gracile* will be found to have been the cause, though cocci can also be found. Wines contain but little lactic acid and much volatile acidity when, owing to improper handling, they have contracted acetic sourness. As mould ferments also produce volatile acids they also can be taken into consideration. In both cases investigation under the microscope throws light on the origin of the volatile acids. If more than 1 per thousand of lactic acid is found, it is to be assumed that this is due to acid-destroying bacteria or to the transformation of sugar caused by bacteria.

Much lactic acid and much volatile acid (2 to 3 per thousand) appear with lactic acid sourness. As causes, *Bacterium mannitopeum,* the mannite ferment of Gayon and Dubourg, and exceptionally also *Bacterium gracile* may be considered. The first two are easily revealed by the microscope. If *Bacterium gracile* is the cause, the presence of mannite in the wine can be shown by microscopical investigation. If *Bacterium gracile* has only destroyed acidity and formed lactic acid, while acetic acid bacteria have formed acetic acid, no mannite will be found.

When much lactic acid and much acetic acid are present and the latter prevails, most frequently it is a case of lactic acid sourness connected with acetic acid sourness.

308 - The Acidification of Musts by the Action of Yeast during Alcoholic Fermentation.

FERNBACH, A. L'acidification des moûts par la levure au cours de la fermentation alcoolique. — *Revue de Viticulture*, Year 20, Vol. XXXIX. No. 997, pp. 113-114. Paris, January 23, 1913.

All liquids containing sugar, when submitted to alcoholic fermentation, undergo during the process an increase in acidity due, in a slight measure, to the production of succinic acid, but chiefly to the formation of volatile acids (acetic acid predominates always, and sometimes is the only volatile acid formed). Numerous different species of yeast are clearly distinguishable by the nature and the proportion of the volatile acids they produce in a given medium.

The experiments of which the results are given later, were undertaken for the purpose of ascertaining how the acidification of the fermenting liquid varies in the use of the same yeast, according to different influences, and particularly in order to discover if this variation is due to the influence of the reaction of the medium.

To this end, the writer sowed a number of cells of the same species of yeast in a series of flasks containing the same sugary liquid, either artificial or natural (grape must), adding increasing amounts of tartaric acid varying from 0 to 8 gr. per litre. In the different flasks of the same series, he determined at the same time whether the fermentation had been completed or not, the acidity of the liquid, the amount of sugar remaining, the alcohol produced and the weight of yeast formed. The following are the figures obtained in the course of some of the writer's experiments, giving the increase in acidity expressed everywhere, as is the original acidity, in mg. of total tartaric acid:

A. *Beer Yeast Br.*

Original acidity		0	25	50	100	200
Increase in acidity	Expt. *a*	59.5	45.4	41	33	6.5
	Expt. *b*	59.8	—	50	50	29.3

B. *Wine Yeast.*

Original acidity		0	25	50	100	200	400
Increase in acidity	Yeast C.	66.5	52	48	22.5	—	—
	Yeast L.	123.5	107	100	91	61.5	44

It is seen that, in all these cases, the less acid the liquid was at first, the greater the subsequent increase in acidity. Thus the various yeasts are affected in the acidification which they produce, by the influence of the medium in which they act, quite independently of their own individual characteristics.

This conclusion is of great importance from the practical standpoint. Acidification has of late been rightly regarded as a means of increasing the stability of fermented beverages, and it has been strongly recommended that those yeasts which give rise to the highest degree of acidity should be selected. It is evident that the influence exerted upon this acidification by the original acidity of the must should be taken into account.

The above mentioned facts show that this matter is no less important theoretically, for the study of the mechanism of alcoholic fermentation. Indeed they furnish a practical means of increasing acid production by yeast, and the writer hopes to show shortly how this method can be employed in the study of the intermediate products of fermentation.

309 - **Analytical Characters of the 1912 Musts in the Canton of Vaud, Switzerland.**

PORCHET, F. and TONDUZ, P. Moûts vaudois 1912. — *Procès-Verbaux de la Société Vaudoise des Sciences naturelles*, No. 2, 1913 (meeting of January 8). Lausanne, January 1913.

This article gives a summary of the analytical statistics of the musts of Vaud in 1912 (1). The analyses dealt with 137 samples. The dry cold weather, which on October 16 encouraged optimism, was unfortunately of very short duration, for on the 21st rain fell once more. This new damp period produced a decrease in quantity and quality — a rare occurrence — causing the ripe grapes to rot, while the less ripe ones remained unharmed.

In spite of this, the predictions were realized in so far that the sugar content of the 1912 musts was, on the average, very similar to that of those of 1911. The following table shows the difference in this respect between the musts of 1912 and the wines of 1911.

District of Aigle-Yvorne-Villeneuve.

	29 samples of 1912 musts.		29 samples of 1911 wines.
	Sugar %	Corresponding alcohol %	Alcohol %
Maximum	23.3	13.2	12.1
Minimum	15.0	8.8	9.4
Average	19.1	11.1	10.6

District of la Côte.

	43 samples of 1912 musts.		41 samples of 1911 wines.
Maximum	20.1	11.9	11.7
Minimum	12.7	7.5	9.6
Average	16.5	9.7	10.5

District of Lavaux.

	31 samples of 1912 musts.		25 samples of 1911 wines.
Maximum	20.3	12.0	12.5
Minimum	13.8	8.1	9.8
Average	17.4	10.2	11.1

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(1) For the 1911 musts and wines of Vaud, see No. 713, *B.* April 1912. (*Ed.*).

District of Morges.

	14 samples of 1912 musts.		12 samples of 1911 wines.
Maximum	16.9	10.5	11.0
Minimum	13.6	8.0	8.8
Average	15.3	9.0	9.0

District of Vevey-Montreux.

	15 samples of 1912 musts.		31 samples of 1911 wines.
Maximum	19.6	11.5	11.9
Minimum	15.4	9.0	9.2
Average	17.5	10.3	10.0

As is shown by these figures, the average alcohol content of the 1912 wines in two of the districts is superior to that of the wines of 1911, while in the three other districts it is inferior; the differences vary between +0.5 per cent. and —0.9 per cent.

Acid content. — The season of 1911 produced wines in the Canton of Vaud which were abnormally deficient in acids, while those of 1912 had a very high acid content. The figures have not yet been generally recorded, but the statement refers not only to the Swiss vineyards, but also to those of the rest of Europe, with the exception of the southern parts of Italy and of Spain.

The acidity of the musts from Vaud which were analysed varied from 9.8 gr. to 16.4 gr. per litre; in the greater number of the samples, it was between 11 and 13 gr. per litre. It is an interesting scientific fact, which has been recorded fairly regularly, that when the fruit ripens with difficulty, the acidity is due essentially to malic acid and not to tartaric acid or acid salts.

Usually the malic acid in wines is split up by the action of a micrococcus into lactic acid and carbonic acid. This causes a decrease in the acidity independently of the settling of the tartrates. At the end of January 1913, this malo-lactic decrease was not yet perceptible in the 1912 Champ-de-l'Air wine, though it contains 6.3 gr. of malic acid out of a total acid content of 13.6 gr. per litre.

OTHER INDUSTRIES DEPENDING ON PLANT PRODUCTS

310 - New Materials for Paper-Making.

1. — New Sources of Paper (*Hedychium coronarium* Koen and Allies). — *Royal Botanic Gardens, Kew: Bulletin of Miscellaneous Information*, No. 9, pp. 373-378. 1912.

2. — Marram Grass for Paper-making. — *Ibid.*, p. 396.

3. — Experiments with New Materials for the Manufacture of Paper. — *Bulletin of the Imperial Institute*, Vol. X, No. 3, pp. 372-380. London, 1912.

1. — *Hedychium coronarium* Zingiberaceæ) is a native of India, being distributed from the Himalayas to Ceylon and Malacca; it is also recorded from Central America, the West Indies, Mauritius and West Africa (Corisco Bay). In some of the States of Brazil it has run wild, being especially abundant at Morrettes in the State of Parana, where it has covered a large tract of swampy country. In Brazil, the plant grows

thickly and completely covers the land. The stems are said to reach a height of 1 to 1½ metres (3 to 5 ft.) and to be about 2-4 cm. in thickness; on the margins of streams, however, the stems grow as high as 2 metres (6ft. 6 in.). After cutting down the stems, some 4 to 5 months must elapse before they grow again.

Paper has been made both from the dried material received from Brazil, and from fresh stems supplied from Kew. The paper in both cases was found to be identical, and the plant seems likely to be a valuable source of material for the paper-maker. The fibre has great tensile strength, the "breaking length" being from 9 000 to 10 000 metres. The elasticity and folding qualities of the paper are exceptional. It can be made to bear ink and possesses parchment qualities without any special treatment. These properties are due to the presence of cells of a semi-gelatinous nature, which are associated with the fibre; the amount of these cells in the unbleached paper is 17.3 per cent. Cellulose in stems when air-dried 41 per cent.; length of fibre in unbleached *Hedychium* 2.61 mm.

The writer gives a description of paper-making and of the physico-chemical properties of the fibre. He concludes by saying that owing to the remarkable qualities of *Hedychium* it seems likely to be in considerable demand in the near future.

The stems of *Amomum hemisphericum* and *Alpinia nutans* (Zingiberaceæ) were also examined as to their paper-making qualities. The former is a native of Java; the latter is recorded from Hong Kong, Formosa, Cochin China, the Eastern Himalaya and the Malay Peninsula; it is also known from the West Indies, Guatemala, Venezuela, Surinam and Brazil. The stems of *Amomum* reach a height of 5 metres (over 16 ft.); those of *Alpinia* are stated to be 2.5 to 3 m. (8 to 10 ft.) high. The latter plant would probably form dense thickets in swampy country.

Yield of unbleached paper: from green stem, *Ammomum* 7.44 per cent., *Alpinia* 5.93 per cent., and from the dry stem respectively 58.2 and 50 per cent. Both plants are suitable for making white and brown paper, but they are considerably inferior to *Hedychium*, being devoid of the self-sizing property of the latter.

2. — Marram grass (*Ammophila arenaria* Link.). This plant grows on the sandhills on the coast of Great Britain and acts as a very valuable sand-binder. Experiments in paper-making have been made with marram grass, which possesses quite useful qualities in this direction. The yield of unbleached paper from the green stem was 17.7 per cent. and that from the dry stem 31.4 per cent. The average length of unbeaten fibres contained in the pulp was 0.65 mm.

3. — The following table gives a summary of the results of the examination of new materials for the manufacture of paper undertaken at the Imperial Institute (London).

Material examined	Moisture on drying at 100-110°C.	Ash in dried material	Yield of pulp (dried at 100-110°C).			Loss in weight in pulp on bleaching	Length of ultimate fibres
			Non-bleached		Bleached		
			Percentage of dried material	Percentage of material as received			
	%	%	%	%	%	%	mm.
Papyrus (stems) from E. Africa	13.6	8.6	31.4	26.3	30.7(1)	2.3	1.32
Papyrus (stems) from the Sudan	13.8	6.9	34.2	29.4	33.1(1)	2.9	1,32
Arundo Donax from the Transvaal	13.4	2.7	27.6	23.9	—	4.8	0.15
Aristida sp. Transvaal. . . .	9.0	2.7	28.2	25.6	25.1(2)	2.3	0.86
"Nipa" (petiole and fibre) from the Malay States . .	21.5	14.2	13.8	10,8	12.6(1)	8.4	1.42
Borassus flabellifer (leaves) from Mozambique	10.3	4.1	48 (3)	43 (3)	—	—	3
Bromelia (leaves) from Brazil.	14.3	7.2	21 (about)	18 (about)	—	—	0.89
Algerian Esparto.	8.8	3.0	32.3	29.5	32 (1)	1.3	1.14

(1) Percentage of dried material. — (2) Percentage of material as received. — (3) Cellulose.

All the fibrous materials enumerated are capable of conversion into pulp suitable for the manufacture of paper, though in some cases it is not known whether they could be utilised to advantage on a commercial scale. The raw materials would probably not realize more than about £ 3 per ton in the United Kingdom, and it is therefore very unlikely that they could be profitably exported, especially in view of their bulky nature. For this reason, in conjunction with the fact that they furnish somewhat small yields of pulp, the best way to deal with these fibrous products would be either to convert the raw material into "half stuff" and export the latter, or to employ it locally for the manufacture of paper.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

311 – **Report for Presentation to the Ghent Congress of 1913, Respecting the Plant Pathology Service, by the International Union of Professional Horticulturists.**

SMET, A. DE (Président de la Chambre syndicale des Horticulteurs Belges, Gand). Rapport sur le service phytopathologique de l'U. H. P. I. — *Union Horticole Professionnelle Internationale, U. H. P. I., Rapports pour le Congrès de Gand en* 1913, *présentés par le Président, H. Muller, Langsur*, pp. 17-19 (n. d.).

By means of circulars and its annual report for 1911, the "Chambre Syndicale des Horticulteurs Belges" has published in detail the proceedings of the Horticultural Congress at Luxemburg. The above-mentioned Chamber has drawn the special attention of the Belgian Government to the changes in the transport service suggested by the Berne International Congress and to the institution of a Service of Plant Pathology. The information thus furnished has been given due consideration by the Belgian Government; the law for the establishment of a Service of Plant Pathology has been passed (1) and, on the occasion of the next Railway Convention, the Government will as far as possible try to meet the wishes of the horticulturists.

Propaganda work in the same direction is in progress in France under the auspices of the "Fédération des Syndicats Horticoles de France." The writer insists upon the necessity of similar work being done in every country; for only in this manner will the International Union of Professional Horticulturists be able to carry on efficiently its international work.

The "Chambre Syndicale des Horticulteurs Belges" has interested itself much in the creation of a Plant Sanitary Service, and has always endeavoured to keep the plants and horticultural products of Belgium free from cryptogamic diseases and from injurious insects; providing its members with instructions and means of combating these pests. By profiting from the attempts made in other countries, the Chamber has elaborated a scheme, which seems to embrace the prophylactic measures necessary for all lands. The Luxemburg Congress unanimously adopted the inspection project put forward by the Belgian Syndical Chamber, and passed a vote expressing their wish that the Service of Plant Pathology should become general throughout Europe. The same Congress voted that all crops should be placed under the care of inspectors whose duty should also include imparting practical instruction to growers regarding methods of controlling plant diseases. Such a service, but placed upon a broader basis, has been established by the law brought forward on March 26, 1912, and approved by royal decree.

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(1) See No. 66, *B.* Jan. 1913. (*Ed.*).

Phytopathological regulations were sanctioned in Holland by the law of March 29, 1909. A Service of Inspection of Horticultural Products was established in France by the decree of May 1, 1911. Plant pathological inspection in Great Britain is governed by a series of regulations (1). The United States have special laws for every State of the Union (2).

The writer suggests that each of the syndicate Associations of the International Union of Professional Horticulturists should be requested to furnish an account of the Service of Plant Pathology in its particular country (3). Once the text of the different laws was obtained, it would be possible to coordinate them, arrange them under a general head, and prefer to the different Governments an official request for the establishment of a Plant Sanitary Service, which should be alike in all the affiliated countries, and make obligatory that all horticultural products when exported should be furnished with a certificate of immunity. This certificate should be drawn up according to one model, as in the case of that adopted by the International Phylloxera Convention of Berne (4).

312 - Decree concerning the Reorganisation of the Service of Phytopathological Inspection of Horticultural Produce in France. (5).

Décret portant réorganisation du Service d'inspection phytopathologique de la production horticole en France. — *Journal officiel de la République française*, Year 25, p. 857. Paris, January 26, 1913.

The President of the French Republic issued the following decree under date of January 16, 1913:

Article 1. — The work of the Service of Phytopathological Inspection of Horticultural Products instituted by the Ministry of Agriculture by the decree of May 1, 1911, has been modified and determined as follows:

Art. 2. — The Staff of the Service is nominated by order of the Ministry within the limits of the appropriation for this object in the Budget of the Ministry of Agriculture. It consists of: *a*) A chief inspector, the Head of the Service, to whom is entrusted the direction and scientific control of each of the branches of the Service, the superintendence of the work of the inspectors and assistant inspectors, the furnishing of necessay instructions to these officers to enable them to carry out all the investigations required by the present decree, and the supplying, when required, of the certificates of phytopathological inspection. *b*) An assistant to the chief inspector, whose duty it is to assist the principal inspector in his work. *c*) Temporary agents, with the title of inspector, entrusted with visiting the horticultural institutions committed to their care to see that the plantations are in good condition, that produce despatched thence harbours no insects known to be injurious, and no cryptogamic diseases capable of spreading, and if necessary, to provide certificates of phytopathological inspection. *d*) Temporary agents, bearing the title of sub-inspectors and capable of supplementing the inspectors of the Service in the branch which is especially entrusted to them.

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(1) See No. 1676, *B.* Dec. 1912.

(2) See No. 182, *B.* Feb. 1913. (*Ed.*).

(3) See in this connection: *L'organisation actuelle du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays.* — Rome, International Institute of Agriculture, 1911. (*Ed.*).

(4) See: CUBONI, G. The Basis of an International Agreement for the Control of Plant Diseases. *B.* Nov. 1912, pp. 2349-2354. (*Ed.*).

(5) See also No. 1604, *B.* May 1911; No. 3084, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*).

Art. 3. — The officers of the Phytopathological Service are required to ensure, within the limits of the present decree and the Ministerial instructions, the supervision of those horticultural establishments and branch institutions entrusted to them. When on inspection tours, the inspectors must be provided with the card proving their identity; this they receive from the Minister of Agriculture.

Art. 4. — The inspectors and sub-inspectors are proposed by the chief inspectors and nominated annually. Their number varies according to the requirements of the Service. The conditions for recruiting inspectors and sub-inspectors are settled by ministerial decree.

Art. 5. — The work of the chief unspector and his assistant is settled by Directors of State Scientific Institutions nominated by the Minister of Agriculture, who will also apportion to each individual his special task.

Art 6. — The chief inspectors, inspectors and sub-inspectors nominated under the present decree receive in remuneration of their services and for their travelling expenses a sum which is not subject to the deductions prescribed by the law of June 9, 1853, in the case of civil pensions and is calculated according to a basis fixed by the decree of the Minister of Agriculture.

Art. 7. — The expenses entailed in the phytopathological inspection of horticultural products are stated in a special clause in the budget of the Ministry of Agriculture. They are apportioned among the persons interested in the following manner: the first charge of the expenses is covered by a fixed annual tax of £1, levied upon each controlled horticultural establishment, and the surplus is divided in proportion to the market value of the products for which phytopathological certificates have been granted. The portion to be contributed by each horticulturist is recovered by means of taxes levied and collected by the Minister of Agriculture, even in the case of total or partial refusal of certificates of phytopathological inspection. These sums are entered under the head of "Various contributions to the budget".

Art. 8. — Every horticulturist who wishes to submit his premises to phytopathological inspection must apply to the Minister of Agriculture before April 1 of each year, writing his request upon stamped paper according to the prescribed form and pledging himself : *a*) To conform absolutely to the instructions of the Minister of Agriculture, or his representative, in all matters concerning phytopathological inspection. *b*) To state in a declaration accompanying his request the precise situation of the plantations to be inspected and the approximate area of each. *c*) Not to include among plants which he sends away, any from unsupervised plantations, without furnishing to the inspector in his district entrusted with supplying phytopathological certificates the name and address of the nurserymen furnishing the said plants ; the establishments of these nurserymen must be entered on the lists of phytopathological inspection. *d*) To send with each request for a certificate of pathological inspection a certified copy of the consular envoice accompanying the goods which tallies with his bookkeeping entires and gives the detailed and total value of the plants sent. *e*) To provide the officiers of the service charged with visiting his establishments with all necessary assistance in the discharge of their duties. *f*) To pay at the prescribed intervals the amount which falls to his share of the expenses incurred in the organization of the Service of Phytopathological Inspection, in accordance with the provisions of article 9 of the law of Dec. 16, 1910 and of article 2 of the present decree.

Art. 9. — The State assumes no responsibility for itself and its agents as regards the possible results, either to the horticulturists or to any third party, of the organization or working of the Service of Phytopathological Inspection provided by the present decree, or as to the acceptance or refusal by foreigners of the certificates of phytopathological inspection.

Art. 10. — As soon as the officials and agents of the Service are aware that the horticulturists have not fulfilled all their engagements, they must at once inform the Minister of Agriculture, who will decide upon the necessary measures to be taken.

Art. 11. — The Ministers of Agriculture and of Finance are entrusted, in their several capacities, with the execution of the present decree.

313 - Royal Decree concerning the Introduction into Libya of Woody, Agricultural, Forest and Ornamental Plants coming from the Kingdom of Italy.

Regio decreto riguardante l'introduzione in Libia delle piante legnose, agrarie, forestali, ornamentali provenienti dal Regno d'Italia. — *Gazetta ufficiale del Regno d'Italia*, Year 1913, No. 32, p. 805. Roma, February 8, 1913.

His Majesty the King of Italy, considering the Law of July 6, 1912, No. 749 ; considering the Royal Decree of November 20, 1912, No. 1205 ; on the proposal of the Minister of the Colonies in accord with the Minister of Agriculture, Industry and Commerce, has, on February 2, 1913, decreed as follows :

Art. 1. — The introduction into Libya of woody, agricultural, forest and ornamental plants coming from the Kingdom of Italy is forbidden unless said plants be accompanied by a certificate of origin issued by the municipal authorities and by a certificate guaranteeing their immunity from such diseases as would endanger the produce of plants cultivated in the Colony.

Art. 2. — Such declaration will be issued by the Royal provincial antiphylloxera delegate or by the technical delegate of the antiphylloxera association, according to the single text of the Laws, June 6, 1901, No. 356, and July 7, 1909, No. 490, on the Associations for the defence against phylloxera, or by the Directors of Stations or of Laboratories of Plant Pathology or of Agricultural Entomology. Horticultural establishments, schools and gardens which are inscribed in the official list which is published every year by the Ministry of Agriculture are exempted from the obligation of presenting the certificates mentioned in the preceding article.

Art. 3. — As for vines, the introduction of rooted cuttings or rooted plants is absolutely forbidden. Only the importation of cuttings is allowed provided they be accompanied by the certificate mentioned in Art. 1.

Art. 4. — Plants coming from abroad are subject to the provisions set forth in the Antiphylloxera Convention signed at Berne on November 3, 1881, besides which their immunity from diseases other than phylloxera is to be recognized by an expert before their introduction is allowed.

Art. 5. — Plants found infected by the diseases mentioned in Art. 1 shall be destroyed and the owner shall have no right to any indemnity. The Minister proposing this Law is charged with the execution of the present Decree.

314 - New Zealand Prohibition against Crown-gall.

The Agricultural Gazette of New South Wales, Vol. XXIII, Part 12, p. 1042. Sydney, December 1912.

The New Zealand Government has issued a proclamation prohibiting the introduction into the Dominion of any fruit or plants infected with the disease known as Root knot, Hairy root, or Crown-gall (*Bacterium tumefaciens*). If any plant, fruit, etc., affected is introduced or attempted to be introduced, it and any wrappings, etc., will be re-shipped or destroyed at port of entry. Re-shipment, however, is conditional on the approval of the inspector, and, in the event of destruction, the fees for such destruction are payable by the person in charge of the consignment.

315 - Rhodesian Restriction on Potatoes.

The Union of South Africa Government Gazette, Vol. X, No. 290, p. 783. Pretoria, November 5, 1912.

The Southern Rhodesia Government Notice No. 319 of 1912, dated 3rd October, reads as follows:

Any consignment of potatoes imported from other parts of South Africa or from oversea, if found on inspection to be infested with the pest known as "root gall worm" (*Heterodera radicicola*), will be refused admittance to Southern Rhodesia or destroyed.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

316 – Effect of the Time of Sowing upon the Susceptibility of Wheat to Bunt *(Tilletia Tritici)*. (1).

MUNERATI, O. Sulla recettività del frumento per la carie in rapporto al tempo di semina. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXI, Part 12, pp. 875-878. Rome, 1912.

From experiments made by the writer in 1909 and 1910, it appeared that the temperature at the moment of sowing and during the days of the first phases of the development of the young plant, has a decided influence upon the susceptibility of the wheat itself to the attacks of *Tilletia Tritici* (Bjerk.) Wint. In order to test this statement further, the writer repeated the experiments in 1910-1911 and in 1911-1912. In the first season a winter wheat (Cologna) and a spring wheat (Marzuolo Veronese) were used, and in 1911-1912 Gentil Rosso and Marzuolo Americano Rosso.

The results of the investigations and observations of these four years show that:

a) A seed which is severely infected with the resting spores of *Tilletia* does not necessarily give rise to a plant which will be attacked by the disease. The factor which in this case determines the susceptibility to the parasite, is the temperature at the time of sowing and during the days of the early phases of development; the more rapidly the wheat grows the better it escapes from the attack of the parasite, and viceversa. The same seed can produce 0 per cent. of infected ears in the first case, as against 80 per cent. in the second.

b) No treatment of the seed will thus ensure immunity from the attacks of bunt. But in practice, it is wise to apply some treatment to the seeds in order to destroy any bunt spores which may chance to adhere to the integument of the wheat; this is the more urgent, when it is desirable, or necessary, to sow late in the autumn or very early in the spring.

c) The application of an adhesive substance (such as is effected by immersing the seeds in a solution of copper sulphate and spraying them repeatedly with lime) does not ensure complete immunity from *Tilletia* in the case of every plant, as it may be attacked either by spores which afterwards adhere to the integument, or by those with which the germinating seed comes into contact in the soil; nevertheless a considerable number of spores are rendered innocuous by the prolonged fungicidal action of the copper compound.

The decided influence of the sowing time upon the susceptibility of wheat to bunt would explain why in past years, when the seed corn received no treatment, seasons when the parasite was rife alternated with those when the crops were almost free from its attacks. The years when the parasite caused great havoc were those when the plants grew slowly during their first phases of development.

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(1) See also No. 1679, *B.* Dec. 1912. (*Ed.*).

The observations made also suggest that when it is wished to determine the efficacy of a fungicide or special method of *Tilletia* control, it is well to sow the treated seed either late in the autumn (in the case of winter varieties) or very early in the spring (for spring kinds), in order that the plants may be as susceptible as possible to the attacks of the parasite.

317 - Lime-Sulphur Washes in the Control of Fumagine and Olive Scale (1).

MEANS OF PREVENTION AND CONTROL

CALABRESI, G. A. La poltiglia solfo-calcica nella lotta contro la fumaggine e la cocciniglia dell'olivo. — *Il Coltivatore*, Year 59, No. 1, pp. 19-20. Casale Monferrato, January, 10, 1913.

In 1912, control experiments of fumagine and the olive scale were made at Vasto (Abruzzi) with lime-sulphur washes (formula of the Royal Experimental Station for the Cultivation of Citrus and Fruit Trees at Acireale, (2), Sicily).

Four applications were made : the first was carried out in three distinct zones of the oliveyards, which served as an experimental plot and 8, 6 and 4 per cent. solutions were respectively used ; in the subsequent spraying, solutions weaker than two per cent. were sprayed on all the trees. These treatments were repeated on each reappearance of the scales.

The scales have almost entirely disappeared from the experimental olive-yard ; the fumagine attack was so far advanced that there was no hope of curing the disease, although the wash had the effect of slightly checking its development.

A 4 per cent. solution of this wash was also applied to some trees which had been grafted three years previously and planted in the spring ; no scorching or other bad effect was noticeable, even on the young buds, which were very plentiful.

These experiments will be repeated, on a larger scale, during 1913.

318 - The Diseases of the White Lupin in the State of Sao Paulo (Brazil).

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

BONDAR, GREGORIO. 'Tremoço branco e suas molestias. — *Secretaria da Agricultura, Commercio e Obras Publicas do Estado de Sao Paulo, Boletin de Agricultura*, Series 13, No. 5, pp. 427-432, 2 figs. São Paulo, 1912.

Amongst the plants cultivated in the State of São Paulo, Brazil, the white lupin (*Lupinus albus*, "Tremoco branco") occupies an important position, especially as a green manure for coffee, vines, etc.; further it is a plant which grows very well and does not fear drought.

On the estate of the Agricultural Institute of Campinas, this plant is attacked at all its stages of development by a disease called by the writer anthracnose, and due, according to him, to a new species of *Gloeosporium*

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(1) See also No. 975, *B*. June 1912 ; and No. 1245, *B*. Aug. 1912. (*Ed*.).

(2) See No. 753, *B*. April 1912. (*Ed*.).

(*G. Lupinus* sp. nov.); the hybrid of the same white lupin grown at the Campinas Institute proved resistant to the disease.

The first sign of infection is the appearance of blackish patches at the base of the leaves; these spread all round the petioles and cause the withering of the leaves attacked. The disease shows its presence first on the stalks by a black discoloration of parts of the cortical tissues, followed by formation of concave black patches. When these extend much over the stem, the plant dies and the roots rot.

According to the statement of the writer, the parasite may cause the destruction of 90 per cent. of the plants.

As the use of remedies is impossible, the following preventive measures may be recommended: *a*) the cultivation of resistant varieties; *b*) the rejection of seeds from infected plants; *c*) leaving unsown soil which has been infected by the fungus during preceding seasons; *d*) the scrupulous observation of good cultural methods.

The writer has further observed that the white lupin and its hybrid are often attacked by *Heterodera radicicola.* This nematode does not cause the death of the hybrid; it was found that the dead plants of white lupin were always infected also by *Gloeosporium.* It therefore seems probable that *Heterodera* merely weakens the plants upon which it lives and predisposes them to fall victims to fungus parasites.

For the control of the nematode the writer advises, amongst other means, a change in rotation and the practising of good agricultural methods.

INSECT PESTS.

GENERALITIES

319 - The Nutrition Conditions of Certain Larvae of Diptera, which are Parasitic on Fruit.

KEILIN, D. Structure du pharynx en fonction du régime chez les larves de Diptères cyclorhaphes. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 155, No. 26, pp. 1548-1550, figs. Paris, December 23, 1912.

ID. Sur les conditions de nutrition de certaines larves de Diptères parasites de fruits. — *Comptes rendus hebdomadaires des Séances de la Société de Biologie*, Vol. LXXIV, No. 1, pp. 24-26. Paris, January 10, 1913.

In his first article the writer showed by reference to numerous examples that the larvæ of certain *Diptera*, whether parasites of plants or animals, or predatory and carnivorous in their habits, in short such larvæ as generally live upon live tissues, never possess chitinous ribs or longitudinal folds in their pharynx. These special structures on the other hand are always present in the pharynx of saprophagous larvæ, which feed upon decomposing animal or vegetable matter. In the same family larvæ can be found with and without these ribs according to their manner of living.

Amongst the *Trypetidae*, the writer has studied the larvæ of *Trypeta* sp. and of *Urophora* sp., both parasites on the capitula of *Centaurea;* their pharynx, like that of all other parasitic larvæ, is without ribs on the ventral wall, which is completely smooth. All the *Trypetidae* of which the larvæ are known have been observed to be parasites of different plants, attacking the stem, flowers or fruits.

Amongst the larvæ found on fruits (which the writer especially deals with in his second article) several are known to do much injury to crops; their life-histories and the methods of their control have been the subject of much research.

M. Keilin has recently been able to examine two of these larvæ *Anastrepha ludens* Loew, from the ripe fruits of *Psidium* from Costa Rica, and *Dacus oleae* Meig., which, as is well known, damages olives. Contrary to his previous observations, the writer found that these two larvæ possess well-developed ribs like those of the saprophagous larvæ. Thus, in the family of the *Trypetidae* there are larvæ (*Trypeta* and *Urophora*) which have no ribs, and others (*Anastrapha ludens* and *Dacus oleae*) which have a pharynx furnished with these longitudinal folds.

In order to explain this fact, it is necessary to suppose that the conditions of life in the fruits are from some points of view analogous to those of a saprophagous existence, in which case it is requisite to determine the particular conditions which bring about this convergence.

Two contingencies are possible: *a*) The diastases of the fruits may exercise an important function in the preparation of the nutritive medium of the larva; these diastases, having been derived from the cells which were punctured by the ovipositor of the female at the moment of egg-laying, may begin to digest the vegetable tissues situated near the egg, which in the case of the olive is surrounded by a brownish zone. The larva, once hatched, destroys the cells in excavating a gallery and thus would continue to provoke the emission of diastases. *b*) Or, on the other hand, the diastases may not be derived from the fruit cells, but may be produced by the micro-organisms introduced by the ovipositor of the female fly and carried on progressively by the larva while making tunnels in the fruit, when the grub would be truly saprophagous. These two possibilities are not contradictory, for it is very likely that the nutritive medium of the larva is prepared both by means of the fruit diastases and by those produced by the micro-organisms which were introduced with the egg.

It seemed to the writer that observations and experiments made *in situ* were necessary to decide this question, interesting alike from the biological and practical standpoints. It would be necessary to study carefully the manner of feeding of these larvæ, in order to ascertain, for instance, whether the larvæ of *Anastrepha ludens* and of *Dacus oleae* can derive nourishment from the fruits without the intervention of a micro-organism: if this is impossible, it should be discovered whether this micro-organism, which is indispensable to the existence of the larva, is not always present on or near the fruit. In the latter case, the destruction of the micro organism would be another means of controlling the destructive insects.

MEANS OF PREVENTION AND CONTROL

320 – The Control of Grasshoppers in South Africa (1).

CARLE, G. La lutte contre les sauterelles dans les pays de l'Afrique du Sud. — *Colonie de Madagascar et Dépendances, Bulletin économique*, Year 12, 2nd. Half-year of 1912, No. 2, pp. 163-166. Tananarive, 1912.

In 1908, a special commission was appointed with the approval of Lord Selborne, the then Commissioner for South Africa, to decide as to the measures to be taken to prevent an invasion of locusts. The Commission, persuaded of the necessity of instituting a widespread preventive enquiry in all the colonies and territories under its supervision, especially as regarded the appearance and effective methods for the control of these pests, established the "Locust Bureau" for the study of the conditions of development of this insect.

The British Colonies, the Territories of South Africa and the Governments of German South-West Africa and of Portuguese East Africa shared in the support of this bureau. The British possessions included the Cape of Good Hope, Natal, the Transvaal, the Orange River Colony (now forming together the Union of South Africa), Southern Rhodesia, and the Protectorates of Bechuanaland, Basutoland and Swaziland. Experience had shown that the appearance of locusts within the territory included in the above-mentioned provinces depended on flights occurring in the bordering countries not within the sphere of British influence; thus the Commission was obliged to obtain at least annual reports on the conditions of existence of the locusts in the respective territories of the Governments of German East Africa, Nyasaland, N. E. Rhodesia and N. W. Rhodesia.

All the administrations took part in the work of the Bureau and all information relating to the flights of the locusts was sent to the Secretary of the Bureau at Pretoria.

The information thus obtained from various sources, was entered by means of conventional signs on a plan. At the end of every month, the Secretary sends to each administration a small plan of South Africa beginning at lat. 10° South, showing at a glance the condition of the development of the locusts in the entire district. All the officials of the colonies interested have already received postcards with a form on the back, whereon may be inscribed the characteristics of the flight (importance, direction, condition, etc.).

The commission meets annually in May to read and study the reports from the different districts. The total of these reports for 1909 forms the fourth annual report of the Bureau. Two reports from Portuguese East Africa are published by the portion of that province which is under the control of the Mozambique Company. It is to be noted that two vast territories, one belonging to the Nyassa Company and the other to the Mozambique Company, though united to Mozambique, yet are practically independent of the Government.

The reports described two species of injurious migratory locusts in South Africa, one with red wings (*Cyrtocantharis septemfasciata*) and the other brown (*Pachytylus sulcicollis*); but it is probable that other locusts have done damage in South Africa.

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(1) See also No. 1521, *B.* May 1911. (*Ed.*).

A flight of *Locusta danina* was observed in 1907; some members of the Locust Bureau consider this species should be referred to the true brown locust; further some non-migratory locusts have been confused with migratory ones, even by experts on the subject. The public is invited to submit to the Bureau specimens of any flight of which the members do not seem to resemble either the brown locust or the true type with red wings already known.

The eggs of the brown locust preserve their vitality for some years (three and a half years being apparently the limit) when there is too little damp to allow of their hatching. Slowly, but surely, the eggs in the end dry up and perish.

The flights of locusts have not always attained the same importance in South Africa. The red-winged locusts appeared in Natal about 1893, where they had not been observed for fifty years; locusts only began doing much damage about 1890, but from that date the agriculturists have suffered loss every other year from the injury caused by these insects, while in the neighbourhood of Johannisburg it was even suggested to give up all cultivation of the ground, if the locusts had continued to make their appearance. . . . . . .

From the fourth report of the Bureau, it appears that in 1910 the locusts had already effected some damage in the German Colony of the Southwest. In 1909, vast flights leaving the Kalahari desert spread over Cape Colony and the Orange River Colony and attained the coast between Port Elizabeth and East London. The locusts laid their eggs, but strong measures were taken as soon as these began to hatch out; and the remaining insects fell a prey to birds.

At the present time, the Commission considers that those districts of Africa which are under its control are practically secure from serious invasion. But it is imperatively necessary to exercise the most diligent supervision in order to be able to control the pest should it reappear.

As the result of experiments, the Locust Bureau expresses its preference in the control of these insects for arsenical mixtures applied to the locusts at the moment of their emergence from the egg; but when they are already on the move an aqueous solution of arsenate of copper is more efficacious. To this should be added a greater or less quantity of molasses and of sugar. Apparatus have been supplied to all the branch offices of the administration; the insecticide ready prepared is put on the market and is supplied free or at reduced prices, thanks to Government subsidies. The control operations were directed by special "locust officers", assisted for the time by soldiers.

The insecticide destroys at once the insects which it touches, but those which are not directly affected perish, being poisoned either by the grass sprayed with solution or by the dead poisoned locusts.

The insecticide now used in Africa is prepared under the care of the Government in suitable iron receptacles containing 1 ½ gallons, and bearing a special mark and the inscription locust poison. Every vessel contains 5 lbs. of arsenate of soda with 69 per cent. of arsenic, 1 gallon of molasses and 10 lbs. of brown sugar. To prepare this poison, 200 lbs. of arsenate of soda are dissolved in 15 gallons of boiling water and sufficient cold water is added to bring the amount up to 20 gallons. Into each receptacle is poured half a gallon of this solution, to which is added later one gallon of molasses, and the whole is carefully mixed. This constitutes the "Prepared Locust Poison".

In the circular of September 1, 1909, the Agricultural Department of the Transvaal advises the following mixture:

a) for locusts at least a fortnight old:

"Prepared Locust Poison"	1 part
Water	66 parts

b) for older locusts:

"Prepared Locust Poison"	1 part
Water	50 parts

Two labourers can prepare 200 receptacles per day.

	s	*d*
Each receptacle costs	1	0
The price of the contents is as follows:		
Molasses		7
Arsenate of soda	1	0
Mixing		1
Sundry expenses		2
Total . . .	2*s*	10*d*

The solution should be sprinkled as sparingly as possible on the vegetation surrounding a swarm of sleeping locusts, or on a strip of ground some yards wide before a swarm on the wing; this prevents the grass or the insects from being soaked with the solution. The locusts are attracted by the sugary liquid and are usually all killed in the space of a few hours.

The experiments of the "Locust Bureau" have shown that, in the absence of all elementary precautions, the cattle of the regions where this treatment is applied are not harmed. It is well to take some measures to guard against skin irritation during the use of the insecticide. The best remedy is to distribute the liquid in hermetically sealed vessels, all ready to be put into the water, and to use a sprayer similar to that used for spraying vines.

321 – Campaign against *Agrotis ypsilon* in India (1).

Communication from Mr. W. B. Heycock, *Director of Agriculture, Behar and Orissa, to the International Institute of Agriculture.*

The campaign against *Agrotis ypsilon*, which was carried on by the Entomological Section of the Agricultural College at Sabour during the last four months of 1912, proved a complete success. About 120 000 moths were caught during September, October and November. About 10 000 acres of land, which used to yield practically nothing on account of this caterpillar pest, will this year give an outturn worth 4 to 5 lakhs of rupees. The methods of procedure were: 1) attracting and killing the moths by means of 2 doz. Andres Maire traps and 2) picking off the first broods of caterpillars from the first attacked areas.

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(1) See No. 83, *B.* Jan. 1913; No. 193, *B.* Feb. 1913. (*Ed.*).

322 - Results of Experiments in the Control of Olive Fly made in France from 1907 to 1912 (1).

CHAPELLE. La lutte contre la mouche de l'olive. — Résultats des expériences du Service de l'Oléiculture. (Année 1912). — *Bulletin mensuel de l'Office de Renseignements agricoles*, Year 11, No. 12, pp. 1703-1707. Paris, December 1912.

The writer, who is the Inspector-Director of the Service of Olive-growing in France, has made many experiments at different places in the South of France during the last six years upon the control of the olive fly (*Dacus oleae*).

These experiments have led to the following conclusions:

1. Sprayings with arsenical molasses made from June to October reduce the damage caused by the insect; and if applied over large areas, or in isolated plantations, the crop is completely protected. In the latter case, the number of sprayings may be reduced.

2. Dry treatment by means of different kinds of poisoned bait spread throughout the oliveyards had no appreciable effect.

3. Mixed treatments were successful, but the experiment of 1910 tends to show that in these the spraying is the only active agent.

The use of strong doses of sugary washes does not promote, as might be feared, the propagation of fumagine, for the small quantities of molasses sprayed on the trees are removed by the first showers of rain.

Clearly the practical method of combating the olive-fly is spraying with a wash prepared according to the following formula:

Molasses containing 2.5 per cent. of arsenate of soda .	15 lbs.
Water to make up.	10 gallons.

This mixture should be applied to the trees in very small quantities (one gallon to 12 or 15 trees at each spraying) and by means of ordinary sprayers furnished with straight jets.

When the oliveyard, from its extent or isolation, offers unusually favourable conditions for treatment, safety can be obtained with two sprayings, the first applied at the beginning of July and the second at the time when the infested trees chiefly harbour pupae (usually early in September).

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(1) See also No. 1051, *B.* March 1911; No. 2369, *B.* July 1911; No. 3065, *B.* Aug-Sept.-Oct. 1911; No. 721, *B.* April 1912. (*Ed.*).

In districts where the crop is late (Maritime Alps, Corsica), it is necessary to watch the evolution of the parasite and, if necessary, to spray a third time in the autumn.

The writer, in conclusion, draws attention to the fact, that under less favourable circumstances than those which attended his experiments (great extent of the oliveyard, its isolation, extreme susceptibility of the olive trees to the parasite), if the protection afforded is not complete, still the amount of disease is noticeably reduced and the returns thus obtained from the crop more than compensate for the expenses incurred.

323 - Experiments in the Control of the Olive Fly by Means of Traps at Poggio Mirteto (Umbria) in 1912.

GORNI, O. and PASSALACQUA, P. Esperienze di lotta contro la mosca delle ulive, eseguite a Poggio Mirteto col sistema delle capannette del prof. Lotrionte e dirette dalla Cattedra ambulante di Agricoltura per la Sabina nel 1912. — *L'Italia Agricola*, Year L, No. 1, pp. 19-20. Piacenza, January 15, 1913.

This experiment was carried out in an oliveyard in the hills of elongated shape and containing about 1100 trees of the Carboncella variety, most of which were mature, while all were in good condition. As the oliveyard was not isolated, an attempt was made to protect at least the central portion, by making an artificial barrier against the olive fly; to do this, every tree in the two or three outermost rows was provided with two olive-fly traps ("capanette dachicide") (1). On each of the other trees only one trap was affixed; the total number used was 1200. From July 3 to October 10, 1912, the traps were sprayed 6 times.

On a first visit to the oliveyard, made on September 10, the writers found considerable infection in the case of about fifty trees of the zone on the south of the oliveyard; but the others were practically free. This fact is to be attributed to the presence of numerous buildings on the southern part of the oliveyard and especially of brick kilns, which were at work throughout the year, and afforded a comfortable and safe shelter to pupæ and adult hybernating flies during the winter. Infection to the extent of 25 per cent. occurred throughout the neighbouring control plantations.

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(1) The "capannetta dachicida", recently devised by Prof. Lotrionte, Director of the Chair of Agriculture of Tivoli (Rome Province), is a small shelter made of tin, or better galvanized iron, 10 by 14 in., bent into one or two ridges, and containing a small bundle of dry twigs, rather loosely tied together, and projecting somewhat from the sides of the shelter. Two pieces of twine, or preferably wire, serve to keep the shelter in shape, secure its contents and suspend it from one of the horizontal branches of the tree. To attract the insects, the bundle of dry twigs is sprayed four or five times during the season with a poisonous mixture; Prof. Lotrionte's formula is 50 to 60 lbs. liquid glucose, 2 lbs. arsenite of soda, 2 lbs. boric acid, 2 lbs. borate of soda and water to make up to 10 gallons. It is calculated that 44 gallons of this mixture suffice for 1000 traps. The mixture is sprayed onto the twigs with a knapsack sprayer with extension rod; a man can spray 600 to 700 in the day. Each trap costs 2*d* ready on the tree, and may last four to six years, especially if made of galvanised iron. The cost of four treatments is about 1 ½*d* per tree. The experiments made with this system in 1911-1912 in the provinces of Rome, Perugia, Pisa, and Lecce gave excellent results. Cf. CENCELLI, A. Difesa contro la mosca olearia. — *Il Coltivatore*, Year 58, No. 36, pp. 593-597, fig. 168, Casale Monferrato, December 30, 1912. (*Ed.*).

From the final results ascertained on the occasion of a visit paid on November 10, it appeared that in the outermost zone on the north, east and west sides, that is to say in the case of the trees in immediate contact with the control oliveyards in which no sort of treatment had been carried out, the average infection was 50 per cent. But on proceeding towards the centre and south side, the disease decreased sensibly, until in the central zone the infection was only 20 per cent.

The observation made in the southern part, where the trees were vigorous and laden with fruit, is interesting. The infection, which showed itself here first and to a somewhat noticeable extent, was afterwards evidently arrested in such a manner that at the time of the last visit, the olive fruits seemed almost all to be free from the fly (5 per cent. infected) ; the writers believe that, though the infection had set in here early owing to the presence of the brick kilns, the traps were able to keep it in check ; and as this part was furthest from neighbouring plantations, it was less liable to subsequent re-infection.

In the control oliveyards close by, the infection varied from 95 to 100 per cent. ; and in the rest of the territory of Poggio Mirteto it was about 90 per cent.

Given the conditions of the experiment, the writers consider the results obtained to be satisfactory and that the traps would yield better results with a more extensive zone of protection.

324 - A Practical and Efficacious Remedy against the Woolly Aphis *(Schizoneura lanigera)*.

CADOREL, ARTHUR. Le Puceron lanigère : un remède pratique et efficace. — *Le Progrès agricole et viticole (Édition de l'Est-Centre)*, Year 34, No. 2, pp. 52-53. Montpellier, January 12, 1913.

The writer recommends as a remedy against the woolly aphis (*Schizoneura lanigera*), which is certainly one of the most difficult insects to destroy, the use of commercial oil paint, as being a simple, practical and economical substance ensuring the destruction of the colonies of aphides.

The paint can be prepared on the farm according to the following formula :

linseed oil	7	lbs.
white lead	1 ½	lb.
oxide of zinc.	1	lb.

The mixture is boiled for 10 minutes, and when cold 1 lb. of turpentine is added. The paint is applied by means of a brush to all the infected parts. As a rule, one application is sufficient ; but in order to be quite safe, two can be made, in the autumn and at the end of June.

By the use of this remedy the writer was able to save some old apple trees, which had been very severely attacked by *Schizoneura lanigera*.

INSECTS INJURIOUS TO VARIOUS CROPS

325 - *Bixadus sierricola*, an Enemy of *Coffea Arabica* in the Belgian Congo.

MAYNÉ, R. Un ennemi sérieux du *Coffea Arabica* au Congo Belge (*Bixadus sierricola* Wh.). — *Bulletin Agricole du Congo Belge*, Vol. III, No. 4, pp. 911-917, figs. 587-591 Brussels, December 1912.

Bixadus sierricola is a beetle already known as a coffee pest in West Africa. The insect reproduces itself annually. The adults appear in the morning from early October to the beginning of January, on the trunks of the coffee trees upon which they completed their development, or on the neighbouring shrubs. The eggs are laid towards the end of September and probably until the close of December at 6 to 12 inches above the ground, exceptionally on three-year-old plants, often on those which are 4 or 5 years old, but especially on old trees, whether they are weak or vigorous. The writer was not able to observe with precision the length of the egg period nor the exact time at which the young larvae appear, but he has reported the occurrence of some fairly well developed larvae on a certain number of trees as early as the second half of March. Anyway, the larval stage, during which *Bixadus* does a great deal of injury, can be divided into three very distinct periods. In the first the young larvae, as soon as they are hatched, destroy the cortex and the cambium zone by excavating galleries. In the second, they penetrate into the roots, where they also make wide tunnels; and later, returning to the exterior of the roots, they devour all the cortex and part of the wood of the latter, which become almost completely detached from the tree owing to the successive attacks of fungi, termites, the larvae of Elaterids and species of Scarabeids; the tree thus loses its stability, bends towards the ground and becomes gradually weaker, while the insect pursues its work of destruction. The trees, however, react by making wound tissues from which numerous adventitions roots develop, only to be destroyed in their turn by successive generations of *Bixadus* assisted by the previously mentioned pests.

The coffee trees in consequence become chlorotic, their fruit does not ripen and after some years of repeated attacks they die from exhaustion. At the close of the third period, the larvae ascend once more to the base of the stem and remain in the ligneous and cambium zones, but especially in the former.

At the end of August and the beginning of September, the larvae begin to pupate; the pupal period varies from 30 to 45 days (40 to 45 days in the case of males).

Means of control: the best is the capture of the insects at the commencement of the rainy season (October). The direct destruction of the larvae is difficult and little practised, but it is well to hunt for the grubs during the first period of their existence. The writer has made experiments against larvae in the third period of their development by injecting carbon disulphide, but with little success as the pests are protected in their galleries by plugs made of scraps of wood.

To meet with success in the attempt, it is better to defer it to the time of the metamorphosis (September), when a hole can be drilled to meet the galleries and a plug introduced, which is impregnated with carbon disulphide, or a mixture of ordinary petroleum and carbon disulphide ; the aperture should be stopped up afterwards with clay, smeared over in its turn with coal-tar. Four fifths of the plants thus treated were freed from the parasites.

Amongst the various preventive methods, the writer mentions two which seem to yield good results.

Since the adult beetles leave the host plant by a hole near the ground, it is important that the whole of the trunk of the tree should remain exposed in order to ensure the escape of the insects. Immediately this has taken place, the trunk should be scraped to a height of about 16 inches, and this portion must be covered with coal-tar. The operation should be performed towards the second half of September, the old holes from which the insects have escaped being stopped up with clay as a preventive measure. It is also necessary to bank up the earth round the trunk of the plants attacked in order to give them a firmer hold of the ground.

The second method consists in substituting the following mixture for coal-tar in order to prevent the deposition of the eggs of *Bixadus*. Four gallons of soft soap are dissolved in the same amount of hot water : to this is added half a gallon of carbolic acid. The mixture is left standing for 24 hours, when it is diluted with from 32 to 40 gallons of rain water till it attains complete homogeneity.

If, however, a plantation has been infested for some years, it is best to burn the plants which are attacked at the time when the larvae inhabit the galleries, and to give up coffee cultivation for a few years.

326 – The Tobacco Thrips and its Ravages in Hungary.

TÖRÖK ELEMÉR. (Attached to the Experiment Station for the Cultivation of Tobacco at Debreczen.). A *Thrips tabaci* kártétele Magyarországon. — *Magyar Dohányujsag*, Year XXX, No. 1, pp. 6-9. Budapest, January 5, 1913.

The tobacco thrips, observed for the first time in Hungary in the year 1890 in the model nurseries of the Government at Arad by M. Coloman Kerpely, Director of the Agricultural Academy and the Experiment Station for Tobacco Cultivation, has spread with increasing rapidity from that date. In 1908, the writer recorded the presence of *Thrips tabaci* in 7 districts of the country, two of which, Arad and Temes, had suffered considerably. In 1909, the invasion was of less severity, a fact due to the season being unfavourable to the propagation of the parasite ; but now the latter threatens to extend even to the eastern portion of Hungary. Nevertheless, *Thrips tabaci* is little known to tobacco-growers, who attribute its ravages to a disease due to the weather.

It is known that this parasite only attacks the leaves of the tobacco, of which it destroys the chlorophyll. White patches occur where the leaf has been punctured and, as the insect is too small to be easily seen, the Hungarian tobacco growers often complain that their plants become lighter in colour every year. The leaves which are attacked lose 30 to 40 per cent., both in quantity and quality. The writer saw some leaves of garden tobacco of the Réthaz variety, which had deteriorated 80 per cent. But the varieties grown do not suffer to the same extent from this pest; there are some which the tobacco thrips attacks by preference, such as cigarette tobacco, while the tobaccos of Szeged, Szamoshat and the region of the Tisza are almost free from its ravages.

This very injurious insect has also made its appearance in other States. In 1878 *Thrips tabaci* was observed for the first time in Bessarabia, where the havoc it wrought was so great that the Russian Government deputed M. Lindemann, Director of the Agricultural Academy at Moscow, to visit the infected zone and try to discover a suitable method of control. This scientist obtained excellent results with an insecticide powder and by spraying with petroleum emulsion.

In Rumania, which is a very important centre of tobacco cultivation and where the crops had been much injured, various methods of control were used with success.

The writer, while admitting the efficacy of these methods, says that, taking into account the difficulty of their application in Hungary, the only remedy which can now be applied in that country is as follows: If *Thrips tabaci* has already made its appearance upon the young greenhouse plants, the lower leaves of the stems must be removed and burnt, as it is well known that at this time the insect is to be found chiefly upon these parts of the plant.

But if the tobacco is attacked after it has been planted out, it is necessary at once after the harvest to plough the infected plots very deep, as by this means the cut stems will be buried so deep that the eggs or larvae upon them will, in any case, perish.

327 - **The Phoenix Skipper** (***Pamphila dysmephila*** **Trim.**).

KELLY, ALBERT, in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 6, pp. 876-882, 1 fig., plates I-V. Pretoria, December 1912.

For some years, *Phoenix reclinata*, Jacq., which promised to become a prominent garden plant in Natal, has been much injured by the attacks of *Pamphila dysmephila* Trim., an African butterfly belonging to the group popularly known as skippers. The insect, which was first observed on some specimens of Phoenix palms in the Government Gardens in Maritzburg, causes in its larval condition a peculiar and extensive defoliation of the plants attacked. Almost at once on emerging from the egg, the caterpillar joins the outside edges of the leaf with silken threads, thus forming a tunnel where it can lie concealed. Then it begins to devour the tip of the leaf, the tube being extended gradually backward as the leaf is demolished, thus affording a fresh place of concealment. Two or three larvae are sufficient to destroy a whole leaf.

Hand-picking and destroying the larvae are the best methods of control. The eggs are more visible than the larvae, and if these are destroyed, much injury can be prevented. It is, however, very necessary to institute a keen and regular inspection, as much damage may be done before the existence of the larvae is observed.

Spraying with arsenate of lead at the rate of 3lbs. to 50 gallons of water may be substituted for hand-picking, but better still, may be regarded as a desirable supplementary treatment.

328 - *Vesperus xatharti*, a Serious Enemy to the Vine in Catalonia (Spain).

Un insecto que causa graves daños a los viñedos. — *Revista del Instituto Agricola Catalán de San Isidro y Organo de la Federación Agricola Catalana-Balear*, Year LXII Part 2, pp. 23-26. Barcelona, January 20, 1913.

For the last two years, a disease has been observed in some of the vineyards of Penadés, which has destroyed a large number of vines. The symptoms resemble those of the so-called "apoplexy" (in Catalan dialect "feridura"), so that the injury has generally been attributed to this disease.

Of late, however, as the larvae of *Vesperus xatharti* (commonly known as "Menge-Mallols") have been discovered in the disturbed soil of a vineyard in the district, which has suffered severely, it is thought that the damage which has been noticed in the Penadés should be attributed to this longicorn beetle.

INJURIOUS VERTEBRATES.

329 - The Control of Field Voles in Italy. (1)

INJURIOUS VERTEBRATES

GHETTI, G. Contro i topi campagnoli. — *L'Italia Agricola*, Year XLIX, No. 24, pp. 581-584, 1 fig. Piacenza, December 30, 1912.

Since 1911, the different products of the soil, and especially crops of lucerne, have been considerably damaged by field voles throughout the greater part of North and Central Italy. In the Province of Modena and also in the other provinces on the borders of Emilia, a bait (crushed maize) poisoned with phosphate of zinc has been adopted as a simple, practical, and relatively cheap means of controlling these pests.

In order to be efficacious, this method must be applied to all ground under lucerne, to pastures, both permanent and temporary, to drainage ditches, as well as to all cart tracks which traverse cultivated land. The bait should be spread during September and October, as at that time the voles are most numerous and feed chiefly on meadow grass. It is also an opportune moment, as it immediately precedes wheat-sowing.

When thoroughly carried out, this method gives excellent results; a few hours after the poisoned maize is laid down, the destruction of the voles commences, and it continues for four or five days; the number of these rodents which survive the treatment is very small.

Nevertheless, just in those zones of the province of Modena where this remedy had been most carefully used in September 1912, considerable damage to the wheat-fields was noticeable towards the end of the year. The observations made by the writer showed that the greater part of the destruction was due to the last generation of field voles ; during September and October these were being suckled by their mothers and were mostly on ploughed land, which, from mistaken motives of economy, had not been treated by the farmers.

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(1) See also No, 1488: *B.* Oct. 1912 and No. 1567, *B.* Nov. 1912. (*Ed.*)

Given the rapidity of reproduction of the field vole and its large broods, together with the ease with which it spreads from the centres of infection to the neighbouring district, the writer considers that for the control of this animal to be efficient, it will be necessary for a special law to be passed obliging the infested provinces to adopt a uniform method of control at the same date.

RUGGERI ALFREDO, *gerente-responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of February and March 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Progress of Mendelian Studies in Great Britain

by

R. C. PUNNETT,

Arthur Balfour Professor of Genetics in the University of Cambridge.

The dramatic discovery of Mendel's work on plant hybridisation in 1900 inaugurated a new era for the breeder of plants and animals, and the opportunities for advance in the knowledge of heredity were in no country more rapidly seized than in Great Britain. The seed here fell upon prepared soil, for the problems to which Mendel found a key had already begun to engage the attention of Mr. Bateson and of Miss Saunders in Cambridge. The account of the experiments which they had started in 1897 and published as the well known 1st Report of the Evolution Committee to the Royal Society in 1902 was the most important contribution to the subject since Mendel's own paper, and was the first to open men's eyes to the vast possibilities latent in Mendel's work. A group of workers rapidly gathered round Bateson in Cambridge, and the contributions to be found under the names of Doncaster, Gregory, Lock, Staples-Browne, Miss Durham, Miss Wheldale and others bore witness to the activity of the rising school of genetics in the University.

All this work, like Mendel's own, was designed and carried out purely with the desire to gain definite knowledge of the workings of heredity, and little or no attention was paid to the economic results which might flow from the application of this knowledge to the affairs of those who bred animals and plants for profit. The material for study was selected on the ground of its cheapness, of the ease with which it could be worked, and of its suitability for giving a speedy answer to the problems put to it. Sweet-peas, mice, stocks, moths, snapdragons and poultry — such was the material investigated, and except for the last named it could hardly be said to possess much economic importance.

But it so happened that the stimulus to genetic work coincided with the rapid rise of the School of Agriculture in the University, and the enormous practical importance of the new knowledge was immediately appreciated by Professor Biffen, who was then starting his now famous experiments in the crossing of cereals. By making use of the methods of Mendelian analysis he was able to show that such qualities as strength, yield, and immunity to rust were transmitted in accordance with Mendel's law of segregation and consequently are under the control of the investigator, who can now devise suitable experiments for combining them together at will. Improved wheats of this kind have already come into use in England, and judging by the competition there is to secure the seed, they have already proved themselves a great success. The analysis of the wheat plant is still being actively carried on in Cambridge by Professor Biffen and his co-workers, and there is no doubt that as time goes on even better and more profitable varieties will be at the service of the British farmer. It is pleasant to be able to record that the importance of the work has been recognised by the Government, who have placed a considerable annual sum at the disposal of the School of Agriculture for research in plant-breeding. This has rendered possible an increase in the scope of the work, and experiments are now being carried out on other plants besides cereals. Among investigations now under way are some concerned with the transmission of fertility in fruit trees, while the striking success of Biffen's work on the nature of immunity to rust in wheats has led to the search for naturally immune individuals in other forms of plant life. Experiments with potatoes have been in progress for several years and thanks to the energy of Dr. Salaman, working on his own estate near Cambridge, and of Mr. Lesley of the School of Agriculture, the formation of a decent potato, naturally immune to *Phytophthora infestans*, seems within measurable distance of realisation.

Nor are the researches at Cambridge confined to plants. Poultry was one of the first subjects of experiment by Bateson and during the past ten years much has been learned of the transmission of various characters. Offering as they do a number of features showing sex-linked inheritance (1), poultry are of importance for gaining an insight into the nature of sex, and of studying the peculiar influence of each sex in the transmission of hereditary properties. Several of these sex-limited characters are now under investigation at Cambridge, while parallel experiments are being carried on by Professor Bateson at Merton.

Two other series of experiments likely to lead to knowledge of economic value are also being carried on at Cambridge. The first of these is concerned with the inheritance of size, and consists in carefully following out the result of a cross between an ordinary fowl and a bantam. The work is not yet sufficiently advanced to permit of complete analysis, but the nature of the F2 generation raised last year strongly suggests that size depends upon definite factors which exhibit ordinary Mendelian segregation. The other set of experiments mentioned concerns the inheritance of the brooding instinct in the hen and of the brown colour of the egg-shell. In England brown eggs are of greater value than white, but hitherto no breed laying brown eggs and in which the hens never want to sit has yet been established. It may be that brown eggs are incompatible with the non-broody habit, just as it is sometimes stated that a breed of cattle cannot be at the same time first rate in both milk-production and beef. It is hoped that the experiments in progress will eventually give definite evidence upon this point.

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(1) See No. 1319, *B*. Sept. 1912. (*Ed.*).

Experiments have also been undertaken with sheep where the results of a cross between Merino rams (from Australia) and Shropshire ewes are being carefully followed. The experiments have just reached the F2 generation, and it is hoped that the knowledge gained from them will eventually render it possible to combine the fleece of the merino with the good mutton qualities of other breeds.

Besides the work just mentioned, there are other sets of experiments being carried out at Cambridge and Merton which may be regarded as forming a group by themselves. Bateson in 1905 was the first to describe in sweet-peas a remarkable case in which two characters each exhibiting ordinary Mendelian segregation nevertheless showed a peculiar distribution with regard to one another. In this particular instance the characters dealt with were colour, blue being dominant to red, and pollen-shape, long being dominant to round. Blue long × red round gave blue long in F1, and in F2 the expected ratio 3 blue : 1 red and also 3 long : 1 round. But the proportion of rounds among the blues was only about 1 in 12, whereas among the reds the rounds were in excess of the longs to the extent of about 3 : 1. Since that date many other cases of this peculiar association of characters have been discovered in other plants, as well as in sweet peas, and certain generalisations have emerged from the study of them. We now know that if A and B represent two factors respectively alternate to their absence (a and b), then if the original cross is of the nature $AB \times ab$ the characters A and B will be more or less completely associated in the F2 generation so that of the 4 possible classes $AB : Ab : aB : ab$ the first and the last will be the most numerous. If, however, the original cross is of the form $Ab \times aB$, then of the four classes in F2 the AB one will be about twice as numerous as either of the two classes Ab and aB, while the class ab will be very rare. Where A and B go into the cross in association they tend to remain associated in F2, whereas when they go into the cross dissociated they tend to remain dissociated in F2. This peculiar phenomenon is not as yet properly understood, and it is with a view to obtaining further knowledge that experiments are being carried on at Merton by Professor Bateson, and at Cambridge by Miss Saunders with stocks, by R. P. Gregory with primulas, and by the writer with sweetpeas.

Recent work, more especially that of Morgan in America, has shewn that similar phenomena occur in animals, and there is no doubt that a proper understanding of them will eventually turn out to be of much importance for the breeder of plants and animals. It is a matter of common observation that characters seem at times to be transmitted in bunches as it were from one parent or other to the offspring, and it is likely that in such cases we are dealing with phenomena of the kind just outlined.

The best equipped Institute in Great Britain for the study of genetics is undoubtedly the John Innes Horticultural Institution at Merton, near London. Started in 1909 with funds derived from private bequest it was fortunate in securing Professor Bateson, who left Cambridge in 1910, as its first Director. Fortunately also its scope is broad and the experimental work undertaken is concerned with the unravelling of the principles of inheritance in the widest sense, apart from considerations of direct economic return. Numbers of experiments are at present being carried out by Professor Bateson and his staff, principally with plants, not the least interesting being a series of experiments dealing with fertility and sterility in fruit trees.

Besides Cambridge and Merton there are several other places where genetic research is being carried on. Mr. Hurst, one of the pioneers in Mendelian studies, has established an experimental station at Burbage near Leicester, which aims at the production of economically valuable varieties of plants and animals by working upon Mendelian lines. Mr. Hurst is experimenting with many different plants and animals, and some of his most interesting experiments concern horses and aim at the production of a pure race of steeplechasers, *i. e.* of animals with a special aptitude for hunting.

Genetic research is also being carried on by Professor Keeble at University College Reading, the chief material investigated being primulas. But perhaps the most interesting work from this source is that dealing with the chemical side of genetic problems. It is well known that in primulas there are white flowers of two kinds, *viz.* those dominant and those recessive to coloured. Professor Keeble and Dr. Armstrong have recently amplified the work of Miss Wheldale and others, and have demonstrated that these two forms of white, though alike in appearance, can be distinguished by definite chemical tests. Such work opens up a new and important field of study, and it is possible that as this branch of knowledge develops the genetic analysis of plants and animals will be greatly simplified by the substitution of direct chemical tests for the elaborate series of breeding experiments which are at present necessary.

Among the experimental work in progress in England should be mentioned that of Mr. Staples-Browne, of Bampton near Oxford, who is continuing his researches with pigeons, more especially with reference to sex-limited characters; also the work of Trow of Cardiff, who has recently contributed a valuable paper on inheritance in *Senecio*. In this paper and in another shortly to appear Dr. Trow has made a definite advance in the understanding of those peculiar cases of association between characters to which reference has already been made.

In Ireland, Professor Wilson of Dublin has lately brought together a number of records dealing with the heredity of coat-colour in cattle and horses and with the milking capacity of cows.

Scotland has also made a start by creating a Lectureship of Genetics in the University of Edinburgh, to which Mr. Darbishire was recently appointed.

In conclusion, it should be mentioned that the study of genetics in Great Britain is not confined to those who work on these islands. Cambridge sends her students all over the world, and the value of genetic research to the breeder is evidenced by the work of Balls on cotton in Egypt, and by that of Leake and of Howard on cereals, cottons, and other plants in India.

The Cultivation of Potatoes under Irrigation in the Neighbourhood of Athens

by

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The climate of Attica, and indeed of the whole of Greece, is characterized by severe drought in summer. Numerous observations made by the National Observatory at Athens show that the mean rainfall at Athens during the spring months February to June is about 150 mm. (5.9 in.) (1); it scarcely ever snows, and as the rain is mostly torrential, most of the water flows rapidly to the sea.

On account of the drought, the potato crops and most of the other vegetables are cultivated on irrigated land, except in the most northern provinces of the Kingdom, as Corfu, Manissa (Thessaly), or in some of the valleys of the Peloponnesus (Arcovia, Laconica) (2) suited at high altudes, where, the summer rainfall exceeds that enjoyed by the plains.

At Athens, as in all large cities, an enormous quantity of potatoes is consumed, and as the supply produced in the vicinity is relatively small, potato-growing has for some years extended from the plains of Attica to the neighbouring plains capable of irrigation.

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(1) The following data are from the Athens Observatory:

Month.	Number of days with rain	Rainfall. mm.	Rainfall. in.	Atmospheric humidity
January	11	55.9	2.18	72.8
February	11	37.6	1.47	74.4
March	11	57.2	2.23	70.4
April	8	22.3	0.87	63.7
May	7	21.4	0.83	58.8
June	4	11.3	0.44	43.3

(*Author's note*).

(2) Annual rainfall at Athens 421.6 mm. 16.60 in.
» » » Corfu 1171.1 » 46.11 »
» » » Zante 979.5 » 38.56 »

(*Author's note*).

The annual production of the villages of Attica is about 5000 tons (1); but though it increases every year in a surprising manner, the supply is insufficient; consequently, large quantities of potatoes from the neighbourhood of Thebes or Corfu (2) are also consumed in Athens.

VARIETIES OF POTATOES GROWN IN GREECE.

Two varieties of potatoes are grown in Attica; these were long ago imported from Trieste and are known on the market under the names of the villages where they are most cultivated.

1) " Patissiotiki " or " Platicote " (Patissia or flat potato). Tubers somewhat small, about the size of a hen's egg, flattish, rounded; eyes superficial; skin regular, yellowish red; flesh yellowish, firm. Its starch content, according to the analyses of the Laboratory of Agricultural Chemistry of Athens, is 13.5 per cent (3). This variety is the most prized on the markets and its retail price is always 5 or 10 lepta (½*d.* to 1 *d.*) per oke (2 ¾ lbs.) more than that of other varieties. Its vegetative period lasts about 4 months.

2) " Kerkyraïki " or " Stronggili " (Corfu or round potato). Tubers medium or large, rounded oval, smooth-skinned, golden yellow; eyes sunk; flesh distinctly yellow, less firm than that of the preceding variety. Starch content 15 per cent. Its yield per acre is a third more than that of the Patissia variety. Its vegetative period is 4 months.

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(1) The production per village is:

	tons
Patissia	1323
Kifissia	590
Chalandri	422
Amaroussi	837
Menidi	1770
Eleusis	59
Aspropyrgos	284

(*Author's note*).

(2) The production of the neighbourhood of Thebes for the year 1911-12 was about 6140 tons, of which the greater part was sold on the Athens market.

(*Author's note*).

(3) The analyses were as follows:

Variety		Weight of tuber gr.	Water %	Dry Matter %	Starch %
Patissioliki	No. 1	139.0	79.4	20.6	14.8
»	» 2	100.6	79.9	20.1	14.3
»	» 3	72.5	82.7	17.3	11.5
Kerkyraïki	» 1	133.5	77.8	22.2	16.4
»	» 2	103.2	79.6	20.4	14.6
»	» 3	98.5	80.2	19.8	14.0

(*Author's note*).

Some varieties of potatoes imported from Germany and grown at the Agricultural Station of Tyrintha produced small tubers which found no purchasers on the markets.

SEASON OF PLANTING.

In districts where the potato is irrigated, two crops are grown in the year, either in the same, or in different, fields. The date of the first planting is from the end of January to the end of February and the crop is lifted from the middle of June to the middle of July: this is the "winter crop." The second time of planting is from the end of July to the end of August and the crop is lifted from the end of October to the end of November: this is the "summer crop."

On account of the scarcity of potatoes on the markets, the crop is often dug before it is ripe, the loss entailed by diminution in weight being made up by the higher prices obtained at these seasons.

ROTATIONS.

Most cultivators, as a rule, grow two crops a year on the same land for several years, manuring the soil annually with the fertilizer mentioned later. When the soil shows signs of fatigue (generally after 3 or 4 years of consecutive cultivation) they replace the summer potato crop by barley, sown early for fodder, and the winter crop by maize for fodder, or some vegetable crop.

In some centres, where the value of land is relatively small, the potato grower prefers only raising one crop annually in the same field — the summer crop which fetches the highest price (July-November) — and subsequently sowing fodder barley.

SEED SELECTION AND PREPARATION.

The largest potatoes are selected for seed, or at any rate those as big as a hen's egg. These must be from the crop immediately preceding, *i. e.* those for winter cultivation should be from the preceding summer crop and those for summer cultivation should be the produce of the preceding winter.

Potatoes required for seed are left in the soil to ripen thoroughly. When pulled up, the selected tubers are wiped with a piece of linen to remove all the earth. Potatoes for summer cultivation, dug at the end of June, are left for 1 or 2 days on the field to dry a little; then they are placed in a shed or under a tree, where they remain 30 to 40 days; during this time they wrinkle owing to loss of moisture, which causes them to sprout readily on planting. This drying until they wrinkle is essential for both winter and summer cultivation, for otherwise most of the buds would not develop when the potato is put in the ground. During this time the heap is turned once or twice so as to air the potatoes; and 4 or 5 days before planting they are watered a little.

The seed potatoes for the winter crop (dug in November, planted in January) are kept in a very thin layer, in a light, dry, well ventilated place, where they very soon turn green.

Before planting, the tubers are cut into two or three, or even more pieces, but care is always taken that each piece shall contain at least three strong eyes. The seed-potatoes of the summer crop can be kept for some days after being thus divided provided they are covered with cloths or straw kept damp.

Some growers prefer Kerkyraiki for the winter crop and Patissiotiki for the summer crop. In this case they grow a small area of the other variety at each season to provide seed for the ensuing crop for sale. others, in order to obtain earlier growth in the following crop dig up the seed potatoes about 20 days before they are quite ripe.

PREPARATION OF THE SOIL AND PLANTING.

A. *Winter crop (February to July)*. — Careful cultivators prepare their fields in winter by two cross ploughings, followed by picking to a depth of from 16 to 20 inches before planting. Others are statisfied with two or three deep ploughings. At the time of planting, the soil is carefully levelled and then divided by ridges into lands 3 ft. to 3 ft. 9 in. wide. In these lands, furrows are opened at 10 to 12 inches apart, and 4 to 6 inches deep according to the compactness of the soil. In order to economise the ground, the ridges separating the irrigation lands are also planted. Often indeed the planting is done first and the ridging afterwards.

The seed potatoes are then placed at the bottom of each furrow at 10 to 12 inches apart and at once covered with a large handful of well-rotted stable manure or with a mixture of this and grape pomace. The potatoes remain thus until March, when the soil is thrown over them with a hoe.

The manure destined for the potato field is prepared and placed in a heap a long time beforehand; it can be purchased at about 7*s*. 6*d*. per ton. In winter, when rendered very damp by the rain, it is turned once or twice, grape pomace often being added in the proportion of a quarter.

In Attica, dung is the only fertilizer used in growing potatoes; it is applied at 12 to 16 tons per acre. The use of chemical fertilizers has not spread, owing to the want of success obtained with them at first which was due to ignorance of the way to use them.

B. *Summer crop (August to November)*. — Thanks to the preceding crop of potatoes, there is generally a good tilth on the land for the summer crop. Before planting, when possible, it is ploughed twice somewhat deeply. It is often necessary to water to facilitate this ploughing, which is carried out in the dry season. The soil is then levelled and divided into lands as for the winter crop; These are then thoroughly wetted and later picked to a depth of about 12 inches as soon as possible. The potatoes are planted like the winter crop, but closer together: 8 to 10 inches in both directions. The sets are covered and the furrows levelled.

For this crop, no manure is used, as the growers consider that at this season it raises the temperature of the soil, thus disturbing the normal development of the plant. Further, the manure left in the ground from the preceding crop is considered sufficient. Seed potatoes which have grown in the ridges are preferred.

The amount of seed per acre is 11½ cwt. in the case of the winter crop, and 14½ cwt. for the summer crop.

HOEING AND WATERING.

A. *Winter crop.* — As has been already remarked, the first hoeing is done towards the middle of March. Later, when the young shoots are 4 to 6 inches high, the soil is hoed once more (called "dry hoeing"). After ten days, if the ground is dry, it is watered for the first time and subsequently, as soon as it can be worked, is hoed and the rows are slightly earthed up. Afterwards, whether the weather is wet or not, the field is watered nearly every week, but without hoeing; all these irrigations are carried out by flooding each land, the water being conveyed by means of small channels.

B. *Summer crop.* — Some days after planting, a light hoeing is effected to break up the crust formed by the watering subsequent to planting. After 12 to 15 days the field is again watered, and hoed as soon as the condition of the soil permits; 8 to 10 days later, if it has not rained, the soil is watered and hoed once more; if it has rained, the watering is omitted. This process is repeated about every week, till there is fear of harming the young plants with the implements. Watering at longer or shorter intervals, according to whether there is rain or not, continues until the end of October.

LIFTING THE POTATOES.

The best time for this is when the leaves and haulms turn yellow, their change of colour being accompanied by the maturity of the potatoes. Generally the winter crop is gathered during the second half of June and the summer one at the end of November. The yield per acre of the former is 7 to 10 tons, and of the latter about 8 tons.

The average wholesale price of the winter potatoes, where they are grown, is near £5 per ton and that of the summer crop £8; they fetch 1¼*d.* to 2*d.* per pound when sold retail in Athens.

Progress and Results in Fruit-Growing in Germany

by

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All the progress in fruit-growing in Germany in the last decade and most of the work on the subject has been in the direction of the improvement and extension of commercial fruit-growing, so as to be able to supply the needs of the country with German fruit.

With the increased population and the greater prosperity of the country, more attention is paid to the hygienic principles which are the foundations of good health and longevity. Fruit and vegetables are necessary to health and are, at the same time, agreeable articles of diet.

I. — The most important work of the German pomologist and fruit-grower has been in the past, and still continues to be, the careful selection and widespread propagation of the best kinds of fruit among the originally overwhelming number of varieties grown in the country. This selection has been often repeated in the course of time in the various fruit-growing districts on account of the great differences in climate and soil.

The varieties of apples and pears given later are placed in the order in which they most usually occur in the 34 local lists (1) of fruit cultivated in Germany.

Apples: **Boskoop Beauty, Golden-Pearmain, Landsberger Reinette, Baumann's Reinette, Charlamowski, Gravenstein, Boiken, Geflammter Kardinal, Prince, Dantziger Kant (Calville de Dantzig), Ribston Pippin, Roter Eiser, Grosse Casseler Reinette, Grosser Bohnapfel, Gelber Edelapfel, Cox's Orange Reinette, Weisser Klarapfel, Apfel aus Croncels, Cellini, Bismarck, Manks, Adersleber Calville, Reinette de Canada, Emperor Alexander.**

Pears: **Louise Bonne d'Avranches, Williams Bon Chrêtien, Beurré Diel, Bonne Grise, Fondante de Charneu, Poire Pastorale, Calebasse Bosc, Grosser Katzenkopf, Napoleon's Butterbirne, Nouveau Poiteau, Josephine von Mecheln, Gellert's Butterbirne, Madeleine d'Eté Verte, Amanlis Butterbirne, Forelle d'Hiver, Pierre Pépin, Muscateller, von Tongre, Doyenné de Juillet, Dr. Jules Guyot, Blumenbach's Butterbirne, Clapp's Liebling, Beurré Clairgeau, Hardenpont's Winter Butterbirne, Vereins-Dechantsbirne, Duchesse d'Angoulême.**

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(1) Lists of standard varieties to be encouraged in different fruit-growing regions. (*Ed.*)

Besides these varieties, there are a number of newer varieties which have not been generally tested and also many excellent so-called local varieties which are widely grown.

II. — During the last ten years, following the example of the German Fruit-Growers' Union at Eisenach, yearly courses have been started for the instruction of those who are to become promoters and teachers of fruit-growing in Germany. The lectures are given by practical and well-known growers and scientists, who give an account of their own experiences in the matters of fruit-growing, the fruit trade and the utilization of fruit. In these courses, while individual views are not disregarded, unity of teaching is aimed at, and in order to avoid contradictory instructions, a certain uniform scheme of instruction is adopted. Simple uniform methods, which bring the most profit to the fruit-grower, are always advocated in these courses.

As far as possible, practical fruit-growers and scientific men lecture alternately. The courses are held regularly every year at places which offer opportunities to the students to visit instructive and interesting fruit plantations, fruit-preserving factories, etc.

The subjects of the last course of lectures of the German Fruit-Growers' Union were: The Decrees and Work of the Chamber of Agriculture for the Promotion of Fruit Growing and the Fruit Trade. The Organization of Sale Associations. — Study of Soils. — The Science of Working and Fertilizing Soils. — Plant Anatomy and Physiology. — The Structure and Chemico-physiological Nature of the Soil. — Food and Manure Requirements of Fruit Trees. — Chemical Manures. — Climatic Conditions for Fruit Growing. — Care of the Food-Supplying Organs of the Fruit Tree. — Root Physiology. — Soil Bacteria and their Relation to Fruit Growing and Horticulture. — New Methods of Soil Aeration. — Watering Fruit Trees. — The Utilization of Fruit and Vegetables: Scientific Basis of the Different Methods of Treating Fruit and Vegetables. — Growing Vegetables for Preserving Factories. — The Best Fruit Varieties for the Preserving Industry and their Cultivation. — Preliminary Preserving of the Different Fruits for further Use in Factories for Fruit Preserves, Jams, Fruit Syrups, Jellies and Fruit Cheeses. — The Manufacture of Fruit Preserves. — Judging Preserved Fruits and Vegetables according to the Legal Requirements and the Legal Decisions hitherto in Force. — Potato Drying Plant — and its Use in the Manufacture of Preserved Fruit and Vegetables. — The Effect of the Composition of Water upon the Keeping of Preserves Boiled in it. — Forestry Schools: The Development of German Forestry Schools and their Influence on Fruit-Growing in Germany. — The Best Soils and the Most Economical Methods for Tree Nurseries. — Working the Soil in Nurseries and Fruit Plantations: Use of Cultivators and other Machines for Nursery Work. — Suitable Distribution of Nurseries. — The Growing of the Best and most widely used Stocks. — Best Grafts and the Time for Grafting.

The lectures are always followed by a discussion. The reports of the courses are published by the Ministry of the Interior in the *Berichten über*

Landwirtschaft under the title "Mesasures for the Promotion of Home Fruit Culture and of Fruit Utilization."

III. — Tours of instruction are made every year conducted by experienced men with a practical knowledge of the subject; German and foreign fruit farms are visited. The members are required to give an account of their observations and experiences. A selection of the most important facts is published.

IV. — Service of Information Concerning Fruit: In no other branch of agriculture do the prices for products of the same value vary so much in different districts as in fruit-growing. For this reason, a Service of Information has been established throughout Germany, which gives to all interested, from the flowering time till the gathering of the crop, information regarding the market prices and all important matters in the different fruit-growing districts of Germany. The Central Station of the Fruit Information Service is the German Fruit-growers' Union at Eisenach, which by means of its weekly gratuitous Report of the fruit-markets disseminates the accurate information supplied by about 130 reporters from 120 centres of information respecting the price of fruit and vegetables, the fruit supply, natural phenomena affecting the crops and prices, and the general condition of the market. The Chambers of Agriculture and the Fruit-Growers' Federations also publish similar reports which, however, confine themselves to giving information respecting their own field of work.

V. — The surest basis for the fruit trade is careful picking and grading and the right packing of the produce. Practical courses of instruction on these subjects are held every year in Germany, both for men and women.

VI. — Markets of specimen produce are very common in Germany, where not only the finest dessert fruit is sold, but also good, sound, cheap fruit for the working people.

VII. — Courses of instruction and apparatus for preserving fruit and vegetables are conducted by experienced teachers; women are now often employed in this work.

VIII. — The improvement and grafting of the different varieties of fruit is actively promoted in Germany by:

a) The careful choice of good, healthy trees producing a large crop of fine fruit, to serve as stock for the supply of scions and slips.

b) The recent breeding of improved German varieties of fruit. Of these I may mention: *Apples:* Berlepsch Gold Reinette; Minister von Hammerstein, an improvement on Landsberger Reinette; Adersleber Calville, a cross between Calville d'Hiver and Gravensteiner, von Zuccalmaglio's Reinette; Ernst Bosch. *Plums:* Bühler Frühzwetsche. *Gooseberries:* Neuwied Earliest; Hönings Earliest. *Strawberries:* Sieger; Deutsch Evern.

The following rules and prescriptions for raising new German fruit varieties have been drawn up at a meeting of Pomologists and noted breeders of new varieties of fruit, which was held at Eisenach.

a) Extensive scientific investigations must be made on the subject of the weakening of fruit trees with age.

b) The deterioration of old varieties makes the breeding of better new ones imperative.

c) The most widely grown varieties of fruit must be improved by taking cuttings for grafting only from the best trees.

d) It is important to aim at producing :

Among *apples :* strong-growing, healthy varieties, producing very heavy crops of market fruit — productive varieties ripening in August, with large, highly-coloured fruit — productive varieties ripening in September and October, with fairly large fruit of fine quality — productive varieties with fairly large fancy-grade fruit for winter table use — late-flowering, heavy-cropping, moderate-sized household and dessert varieties — good, heavy-cropping varieties resistant to woolly aphis — upright, robust varieties, with fruit not highly coloured, for roadside planting.

Pears : varieties ripening in August, good, heavy-croppers, with large fruit — large, heavy-cropping, extra-fine, coloured varieties, sound on the tree and suitable for winter dessert — heavy-cropping varieties, suitable for preserving especially whole.

Cherries : fine heavy-cropping Morellos for preserving.

Plums : heavy-cropping and early-ripening varieties, giving fine, large market fruit — good, heavy-cropping plums and damsons of moderate size, specially good for preserving, drying and jam-making.

Peaches : hardy, heavy-cropping, early varieties *coming true from seed,* with fine large fruit easily separating from the stone — hardy, heavy-cropping varieties, with fine and white-fleshed fruit *easily separating from the stone* and suitable for preserving. — hardy, heavy-cropping *mid-early* large-fruited varieties *with the flesh readily separating from the stone.*

Apricots : heavy-cropping varieties with firm yellow flesh, suitable for preserving.

Gooseberries : varieties *resistant to American Gooseberry Mildew.*

Red currants - seedless varieties.

Strawberries : ever-bearing, large-fruited varieties.

e) The breeding of varieties which come true from seed.

f) The popularisation of the best methods of pollination, so as to avoid chance crossing.

g) Improvement of wild stocks and of varieties suitable for intermediate grafting. At the invitation of the German Fruit-Growers' Union at Eisenach, many Horticultural Schools and Model Gardens and certain well-known pomologists and fruit-breeders are taking part in this work.

h) The obtaining of legal protection for new selected varieties of fruit.

IX. — The increased supply of the best varieties of dessert fruit is one of the chief features of the recent development of fruit-growing in Germany. The production of fruit of fine quality has made extraordinary progress in Germany during the last decade. The first place as regards yield is taken by bush apples on Paradise. In comparison with the standard the bush is of course shorter-lived and is more particular as to soil and attention, also it does not stand under-crops of bush fruit and vegetables as well as the former. But on the other hand, it fruits much earlier, bears larger crops and pays better, because more trees can be grown on the same area and its fruit is much finer and more perfect in shape and thus fetches a higher price. It is chiefly apples and peaches which are grown in bush form.

The commercial growing of fruit, especially of the finest highest priced dessert fruit, can only be practised in districts where the natural conditions are especially favourable for fruit-growing in general and for some given species or variety in particular. We already possess in Germany a large number of such fruit-growing districts, *viz.* for early plums : Bühl and the Bavarian Palatinate ; for cherries : Thuringia, Baden, Werder, Guben, and the Alte Land near Hamburg ; for small fruit : the Vorgebirge and Vierlanden near Hamburg ; for pears and apples : most of the German fruit-growing districts ; for peaches : the Rhineland, the Palatinate, Saxony and the whole of South and Central Germany where there are favourable exposed, warm positions to be had.

X. — The system of intercalary crops is steadily increasing in German fruit-growing, and their utility and advantage to the fruit trade is ever increasing. For intercalary and under crops the following are used : currants, strawberries, raspberries, gooseberries, various kinds of vegetables, chiefly beans, and also tomatoes and lilies-of-the-valley to send by post. Experienced and sucessful fruit-growers reckon to make an average net profit of £ 10 per acre, not including the fruit borne by the fruit trees under and between which the other crops have been grown. Many of these crops, under favourable circumstances, bring in twice or three times the profit stated above.

XI. — Fruit-growing on the railway embankments is continually increasing. A measure and example of this is given by the fact that in 1909, 94 000 fruit trees were planted in the Kingdom of Bavaria alone, *viz.* : 40 000 apples, 14 000 pears, 28 000 plums, 7 000 cherries, 3 000 agriots, 600 peaches and apricots, 2 000 walnuts and hazels and 200 quinces. Up to 1909, about a quarter of a million fruit trees had been planted on the railway embankments in Germany, of which the great number (about three-quarters) were apple trees, the rest being pears, plums, cherries, and morellos. The shape most used is the half standard, but both standards and bushes have been planted.

XII. — Cold storage depots for keeping fruit fresh for a long time, till a suitable opportunity occurs for its sale, have been established under the control and assistance of the German Fruit-Growers' Union. In this manner there is no necessity for the fruit market to be glutted at the time the crop ripens and for the produce to be sold at prices far below its value ; and these establishments have been of the greatest service to the growers sharing in them.

XIII. — The domestic utilization of fruit and the promotion of this by instruction courses held in the different fruit-growing districts of Germany by competent teachers of fruit culture, (many of whom of late years have been women) is continually on the increase. An attempt is now made to bring forward the domestic side more than had hitherto been done, and only such work is attempted as can be accomplished cheaply and with simple appliances, and which provides in a short time large quantities of tasty, well-preserved fruit and vegetables. The following are the subjects treated : jam-making — preparation of cheeses and jellies — making of fruit wines — bottling and canning of fruit — fruit drying — preparation of non-alcoholic beverages, such as fruit wines and syrups. The manufacture of the above preserves in factories increases every year in Germany ; thus, factories, have been started with a plant capable of dealing with 50 tons of asparagus daily.

XIV. — Model fruit gardens, laid out by officials and Corporate Bodies or by the State and the provinces, have determined to give up growing many different varieties of fruit and paying attention to the cultivation of trees in special forms, and to become experimental fruit plantations. They aim at :

a) Discovering, by means of experiments in cultivating different varieties, those kinds of fruit which appear best suited for growing in the area served by the model garden and the production of grafts from the most valuable trees.

b) The right naming of widely-grown varieties of fruit, which are either wrongly named, or have various different names.

c) Testing the different stocks ; the right distance apart for planting; the most suitable shape for the various species and varieties of fruit ; model plantations with undercrops as demonstrations for commercial fruit-growers and farmers.

d) Manuring experiments with different chemicals in order to determine the best and the most efficacious amount to be used.

e) The control of enemies ; testing control methods.

f) Amateur fruit-growing for the purpose of discovering the best kinds for the most varied purposes.

The model gardens are open to all seekers after information. Courses of instruction for fruit-growers and assistants are always being held on tree management, and the treatment, gathering, packing and utilization of fruit.

XV. — The fruit shows during the last ten years have been arranged chiefly with a view to the encouragement of commercial fruit-growing and providing Germany with home-grown produce.

Instead of the assortments of fruit of large size and exhibits of only 3 to 6 specimens, which only benefited exhibitors of the most numerous kinds without any regard to the value of the fruit, the exibitor is now required to furnish a ton or more of the produce of the few best varieties

To attain this end, the programmes of the German fruit exhibitions include competitions for the best and finest fruits of certain prescribed choice varieties in order to show the perfection attained by the German breeder of dessert fruit. Prizes are also offered for other things, *e. g.*: the representation of the kind of fruit culture practised by the exhibitor or by an entire fruit-growing district or province. Further, the exhibition of

Grading of Fruit by Size in Germany.

		Fancy	Grade I	Grade II
Apples.				
Class I	Weight of each fruit	over 250 gr. (9 oz.)	180-250 gr. (6½-9 oz.)	120-180 gr. (4¼-6½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 200	200-275	275-400
Class II	Weight of each fruit	over 200 gr. (7¼ oz.)	150-200 gr. (5½-7¼ oz.)	100-150 gr. (3½-5½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 250	250-330	330-500
Class III	Weight of each fruit	over 180 gr. (6½ oz.)	120-180 gr. (4¼-6½ oz.)	80-120 gr. (2¾-4¼ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 275	275-400	400-600
Class IV	Weight of each fruit	over 150 gr. (5½ oz.)	100-150 gr. (3½-5½ oz.)	60-100 gr. (2-3½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 330	330-500	500-800
Pears.				
Class I	Weight of each fruit	over 250 gr. (9 oz.)	180-250 gr. (6½-9 oz.)	120-180 gr. (4¼-6½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 200	200-275	275-400
Class II	Weight of each fruit	over 200 gr. (7¼ oz.)	150-200 gr. (5½-7¼ oz.)	100-150 gr. (3½-5½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 250	250-330	330-500
Class III	Weight of each fruit	over 150 gr. (5½ oz.)	100-150 gr. (3½-5½ oz.)	60-100 gr. (2-3½ oz.)
	Number of fruits to 50 kg. (110 lbs.)	not over 330	330-500	500-800

such varieties, packed for the market, as are most suitable for given districts and of greatest commercial value.

XVI. — The interests of fruit-growing in Germany are promoted also by two new systems introduced by the German Fruit-growers' Union at Eisenach; a uniform method of labelling and a uniform grading according to size for the whole of Germany. Thus, the most valuable economic varieties of apples are divided into early-ripening or summer varieties (Nos. 1-15), autumn varieties (Nos. 16-40) and winter varieties (Nos. 41-99); pears are similarly divided.

The uniform method of grading by size leads to a universally recognized trade scale which is recognized also in the Law Courts in cases of dispute.

The accompanying table gives details. It is important that only the given number of fruit should go to the 50 kg. weight. In the case of fruits from the south (oranges, lemons, etc.) it has long been the trade custom to determine the value and quality of the fruit by the number to 50 kg.

A certain latitude is necessary regarding the weight and number of fruit of the different grades: this has been given in the table.

XVII. — Much progress has been made in fruit-growing in Germany; the following may be mentioned: new measures for controlling diseases and pests; legal enactments for the protection of fruit trees; experiments in manuring fruit trees with chemicals in order to ascertain the best kinds and mixtures; experimental planting to determine the most suitable species and varieties of trees for permanent cultivation; the careful selection (by reference to books of control and yield) of the best trees to supply slips for re-grafting inferior varieties.

This subject together with others which could not be treated at length within the limits of this article, is dealt with in many of the publications of the German Fruit-Growers' Union (Deutschen Pomologen Verein) at Eisenach, which may be obtained on application by those interested in the subject.

For years past, many millions of young well-grown fruit trees of the best selected varieties have been planted in Germany. The favourable climate of that country, the excellent management of the trees and the beauty and fine flavour of the produce place German fruit culture in the first rank. Supported by scientific men and by the merchant class, numerous well-instructed officials, inspectors and fruit growers are occupied in turning to good account all the latest knowledge which may serve to promote fruit cultivation.

The Manufacture of Butter and Cheese with Culture Starters in Italy

by

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of the Royal Higher School of Agriculture of Milan.

The use of culture starters in the preparation of butter and cheese in Italy dates respectively from the years 1895 and 1903.

Butter. — In the summer of 1895 the late Prof. Giuseppe Sartori and I, were at Copenhagen, encouraged by the Minister of Agriculture, to study the Danish method of butter making with selected starters, This method, as is well known, consists in pasteurizing the cream with the object of killing or paralyzing the natural germs, which may be good or bad, and then adding a pure culture of certain determined ferments, which were shown in 1890 by Prof. Vincent Storch of the Agricultural Station of Copenhagen to be the specific agents in the ripening of cream.

In this manner the factors of chance and empirism were eliminated from the process of the souring of cream, which with the old methods used to take place naturally during the rising of the cream according to our methods, or was artificially brought about in centrifugated cream by the addition of sour buttermilk or of some other empirical starter, as was customary in the North of Europe.

On our return to Italy we hastened to divulge the salutary reform. I, who was chiefly interested from the scientific point of view, emphasized the hygienic and bacteriological significance of the process, in lectures held at the Agricultural Association of Lombardy, at the Athenaeum of Brescia, and at the Royal Italian Society of Hygiene. Sartori, who studied the question in its technical aspect, actively set to work to describe the practical execution of the new method in reports to the Ministry, to experiment it in the dairy of the Royal Agricultural School of Brescia, and to teach it and to spread it amongst producers by means of lectures, and verbal and printed instructions. And already in 1897 he was able to announce that the reform had been definitively adopted by several dairies (1).

The Ministry of Agriculture began to favour the propaganda with subsidies and by means of special competitions for butter prepared with culture starters (Lodi 1898, Milan 1906, Turin 1911).

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(1) See *Bollettino Ufficiale del Ministero di Agricoltura*, Rome 1897.

(Author's note).

The first to adopt the new process were the great dairies of the district of Milan among which the firms Antonio Zazzera of Codogno, Polenghi Lombardo of Lodi and Codogno and Locate Triulzi near Milan occupy most honourable positions. The example of these was soon followed by other firms, especially of Lower Lombardy (Mangiarotti of Lomello, Gallone of Milan, Gianelli Majno of Mortara, etc). In fact this region produces more butter than any other milk-producing district of Northern Italy; it is here that, owing to the distribution of landed property and to the favourable topographical conditions it is possible to collect the large quantities of milk necessary to the creation of great industrial establishments like those of San Fiorano, Somaglia, Acquanegra, Olmeneta, Secugnago, Sant'Angelo Lodigiano, Melegnano, Casalpusterlengo, Offanengo, Rogoredo, Abbiategrasso, Borgosatollo, Soresina, Casalbuttano, etc. All these are localities in which important dairies were founded either independently or as branch houses of other firms, and in all of which the Danish method of buttermaking was adopted.

At the same time other regions of Italy, such as Piedmont, Emilia, Venetia, Friuli, Liguria are not without examples of large dairies in which selected butter starters are used, if not continuously at least intertermittently when required and according to demand; their number is always increasing. Quite recently a large Piedmontese dairy, Barberi of Moretta, has, with my assistance, adopted culture starters.

It is not an easy task to ascertain the quantity of butter made at present on the Danish system in Italy, as industrial firms do not like to give publicity to their affairs, partly through fear of heavier taxation. It may, however, be approximately deduced from the statistics of exports, admitting that the butter exported, about 78 700 cwt. per annum, is all made with culture starters. It is, however, to be noted that a portion of the butter exported, especially that for the French Riviera, is still prepared from cream allowed to rise and ripen naturally, while on the other hand butter made on the Danish system is demanded also by the home trade, thus proving the increasing recognition of the advantages offered by the new method.

As is well known, these advantages may be summarized as follows: more delicate aroma, greater constancy of type and improved keeping qualities. Of these the most generally recognised are the two latter and especcially the last, namely the greater resistance to turning rancid. Upon this resistance the greatest stress is laid in judging butters in shows and competitions. As for the aroma, the same observation has been made in Italy as abroad, especially in France. There are some farms in which the butter made in the old way turns out more sweetly scented than by the Danish method. Whether this depends upon special natural aromas or on special breeds of aroma-producing bacteria, both of which are destroyed by pasteurizing the cream and cannot be developed or replaced by the selected starters now in use, is a question requiring further study. Moreover it must not be forgotten that the development of the taste in butter made on the Danish lines is always slower than in butters made in the old way, and that on the other hand the unsatisfactory results of the Danish method are frequently due to the negligent and imperfect way of applying it. Some dairies which had abandoned it have returned to it after having introduced some opportune modification either in the pasteurizing process, or in the multiplication and choice of the ferments, or in the inoculation, incubation and acidification of the cream. As for the original cultures used in Italy, they come almost exclusively from abroad. Among the firms patronized, Blauenfeldt and Tvede of Copenhagen, Hansen also of Copenhagen and H. Berend and Co. of Wildeshausen deserve to be mentioned. Regarding the multiplication of the ferments and the ripening of the cream, it is not easy to know the methods adopted by the different dairies, as these like to keep to themselves their technical details which often contain the secret of their success. Besides, it is obvious that exactly the same rules cannot be followed in all cases, especially as the demands of the customers in the matter of flavour and degree of acidity of the butter have to be complied with.

But if there may still exist some uncertainty and some exceptions concerning the delicacy and pleasantness of the taste, in the matter of amount, purity and constancy of the flavour the superiority of butter made on the Danish system is being always more firmly established; this is demonstrated by the facts that the home consumption of butter made with culture starters is on the increase, and that the system is being utilized for the improvement of butters destitute of taste, as is the case sometimes in winter, or of second rate butters such as whey butter, especially when this is a by-product of the making of cheese resembling ewes' milk cheese. In this case the cream acquires an unpleasant taste and odour which can be attenuated, if not removed altogether only by pasteurization and by the addition of a good culture starter. In other words the use of culture starters is constantly gaining favour as a means of improving naturally inferior butters and raising them to the level of good butters.

Cheese. — In 1903, under the presidency of Senator Giulio Vigoni, an Association among cheese producers and traders was formed in Milan with the object of experimenting practically the methods proposed by me for the improved manufacture of cheese.

This method is based upon the same principles as those upon which the Danish method of butter making is founded; that is, using a milk which is bacteriologically pure and to which pure cultures of good cheese ferments have been added. Here, however, the task is more difficult for the two following reasons: in the first place for the purification of the milk, pasteurization cannot be relied upon in an absolute manner, it having been shown that the temperature to which milk must be raised so as to kill all the germs it may contain is injurious to its properties for cheese making: secondly, because while the ripening of cream, which is after all only a mere acidification, is very simple, the ripening of cheese is a very complex process of which we are still far from knowing all the factors and all the biochemical products.

Nevertheless my scientific and practival investigations had put me in possession of facts that seemed to me to be of immediate practical application for the improvement of the manufacture of at least the hard or cooked curd cheeses, the making of which as well as the micro-flora which accompanies their ripening being much simpler than in the case of soft cheeses. These facts may be summarized as follows :

1) By means of opportune hygienic measures which can be carried out in practice, it is possible, without having recourse to pasteurization, to obtain a milk relatively free from bacteria, and sufficiently so to allow of the useful addition of selected ferments. These measures must be taken *ab ovo*, that is by *preventing* the contamination of the milk (devoting attention to the feeding, to the cleanliness of the cows and especially of their udders, to clean milking etc), and they must be completed by *preventing* the multiplication of the bacteria in the milk (cooling and protecting the milk up to the moment of working it up).

2). The present knowledge on the ripening agents of cooked-curd cheeses is sufficient to allow of the substitution of the empirical ferments now used in cheese making (fermented whey, fermented milk, etc.) by pure cultures of certain ferments. Provided that in the choice of ferments the following scientific and practical facts relative to the making and ripening of hard cheeses be borne in mind : *a*) that in these cheeses a rapid lactic fermentation takes place without production of gas and accompanied by proteolytic processes. *b*) that their cooking temperature attains 50° C (122° F) and upwards. Consequently the bacteria to be chosen must be taken from good cheeses, and must possess the following general physiological requisites : they must be lactic ferments not producing gas, energetic, proteolytic and resistant to heat.

3. The use of selected ferments requires processes favourable to them. With this object it is necessary : *a*) to consider the most favourable conditions of temperature, moisture, etc., for their development and action ; *b*) to exclude every kind of empirical starter and of impure rennet that may neutralise the action of the culture starters; *c*) to abstain from all those expedients, such as the use of too high temperatures, of an excessive degree of acidity and of antiseptics which tend to control harmful germs but at the same time prove injurious to the useful ones.

Working on the above lines, the Association began in 1903 at the Trenno cheese factory near Milan to use culture starters in the preparation of the classical Italian cheese, *Parmesan* or *Grana*. From the very beginning success attended the new deparcture, so that already in 1906 at the Milan International Exhibition three year-old ripe experimental cheeses could be presented together with the control cheeses, and they obtained completely favourable judgment from two international juries. The authoritative "Milchzeitung" of Leipzig (1) said that it was the first time that a Commission of international experts could verify the results obtained, *with rigorously experimental methods*, by selected ferments, and convince itself of the possibility of exerting a favourable action on the quality of the cheeses made by introducing culture starters into practical use. Encuraged by the good results obtained with Parmesan of the Lombard type (Lodigiano) and of the Emilian type (Reggiano), the Association turned its attention to other types of hard cheeses, such as those of the Valtellina (Bitto), of the Bergamo district (Branzi), of the Friuli (Montasio), the cacio cavallo, the Swiss cheeses (Fribourg and Emmental) and margarine cheeses, and with all of them obtained further confirmation of the value of the method.

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(1) Year 1907, No. 9.

All who have tried and adopted it bear witness to the following advantages: 1) considerable reduction in the number of defective cheeses; 2) greater uniformity of characters; 3) improvement in the most esteemed qualities (eyes, softness, flavour); 4) improved keeping quality.

In 1905 the Association resolved to found a cooperative bacteriological laboratory, under my direction, for the preparation of selected ferments, in order to supply them to both members and non-members at cost price and in the case of scientific institutions, travelling lectureships of agriculture, etc., at reduced prices and even gratis.

By means of lectures, communications to national and international congresses, of exhibits at shows and competitions, and of advice given personally, or by printed leaflets, the modern principles of cheese-making founded on bacteriology and on hygiene were spread throughout the country. The results of researches and of experiments embodied in yearly reports are published in the Official Bulletin (1904 and following years) of the Ministry of Agriculture (which grants a subsidy to the Association). So that now it may be said that the knowledge concerning culture starters and their use has become public property.

In the last seven years (1906-1912) 56 629 doses of culture starters, each sufficient for 110 gallons of milk, were distributed. The figures for the several years are as follows: 1906, 2276; 1907, 6449; 1908,6261; 1909, 6564; 1910, 12114; 1911, 11609; 1912, 11356. The decrease of the two years 1911-12 is due partly to the smaller quantity of milk treated by several consumers on account either of the rise in the price of milk or of the foot-and mouth disease, and partly to the fact that some of the usual consumers suspended the manufacture of cheese in favour of the preparation of condensed and sterilized milk. Among the constant consumers of culture starters several of the best and most conscientious cheese makers and the principal industrial dairies are to be found (1).

Whilst at the Milan International Exhibition of 1906 the only cheeses made with culture starters were those of the above mentioned Association, at the Jubilee Exhibition at Turin in 1911 several cheeses made with culture starters were shown, also in the exhibits of the Province of Reggio at a meeting of cheese manufacturers and others interested in cheese, promoted by the Association in March 1912 at Milan, and to which twelve travelling lectureships, the Italian Association of members of the industry and trade of milk products, the National Union of Social Dairies, as well as numerous agricultural Societies, Chambers of Commerce, Provincial Councils, Agricultural banks, professors of dairying, agricultural members of the Chamber of Deputies and of the Senate, etc, had adhered, a resolution was adopted recommending agriculturists and the manufacturers of cheese to follow the new lines of cheese making based on the union of hygienic conditions of the dairy with selected ferments.

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(1) GORINI. *Rendiconti del Reale Istituto Lombardo di Scienze e Lettere*, Milano, 1912, p. 865.

We are therefore fully justified in affirming that the improved modern system of cheese making is now firmly established in Italy, not only in agricultural institutions and schools of dairying, but also in agricultural and industrial pratice.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

ISLATIVE
D ADMINI-
ATIVE
ASURES

330 - **Italian Law for the Protection and Increase of the Production of Live Stock in the Country.**

Legge italiana per la tutela e l'incremento della produzione zootecnica nazionale. — *Gazzetta Ufficiale del Regno d'Italia*, Year 1912, No. 190, August 12, 1912; Year 1913, No 12, pp. 331-332, January 16, 1913. Rome.

The Royal Decree No. 1395, dated December 19, 1912, approves the Regulations for the execution of the Law No. 832 of July 6, 1912, concerning measures for the protection and for the increase of the production of animal husbandry in the country.

According to this law " The number of stallions in the State depots will be raised in five fiscal years to 1200. For this purpose the following sums are set apart for increasing the appropriations for this item :

1912-1913	£ 25 376	1915-1916	£ 44 409
1913-1914	£ 31 721	1916-1917	£ 50 753
1914-1914	£ 38 065		

In the selection of the stallions to be purchased special attention will be paid to the need of producing artillery horses (art. 1).

" In the budget of the Ministry of Agriculture, Industry and Commerce, beginning with the year 1912-1913, the sum of £ 7930 will be devoted to increase the appropriations for the following: Encouragement of the production of horses (prizes for stallions and brood mares; subventions for the purchase of breeding animals; sale of stallions and mares at reduced prices; prizes at races) and encouragement for the production of mules (breeding of asses; concession of donkey stallions; subventions for the establishment and working of stations of donkey stallions; prizes to breeders). " (Art. 2).

" With the object of increasing and improving the breeding of cattle, sheep, pigs and poultry the Minister of Agriculture, Industry and Commerce :

" *a*) Promotes the establishment of bull, ram and boar stations and subsidizes them, granting also breeding animals.

" *b*) Subsidizes the importation of breeding animals of improved races.

" *c*) Grants prizes to those breeders who, uniting in associations, establish special farms for the raising of calves on mountain pastures or in other appropriated localities.

" *d*) Organises directly : 1) prize shows for breeding animals, and subsidizes those shows that are organised by local bodies or committees ; 2) prize competitions for the cultivation of forage plants and for the systematic feeding of live stock, and subsidizes those promoted by local bodies ; 3) prize competitions for the use of motors to replace animals for drawing agricultural machines and implements.

" *e*) Promotes and subsidizes exibitions of animals for the butcher.

" *f*) Favours the development of mutual insurance associations against mortality in live stock, and of dairy associations and of their unions or federations, facilitating their establishment and their operations, by means of contributions in money and by rewarding with prizes the best organized and most efficient ones.

" *g*) Promotes and subsidizes the establishment and the working of associations and cooperative societies formed among producers for the organization of general warehouses with annexed markets for wool.

" *h*) Subsidizes the associations of agriculturists formed for carrying out undertakings for the improvement of animal husbandry.

" *i*) Founds and subsidizes new institutions for animal husbandry and poultry stations and depots where their reed is recognized, considering the conditions of the different regions in this respect and the eventual contribution of local bodies.

" *l*) Grants contributions for the establishment of animal husbandry sections attached to the travelling agricultural lectureships.

" *m*) Promotes and encourages by means of lectures, temporary courses, scholarships, and in other ways, the propaganda in favour of the intensification of the yield of animal husbandry." (Art. 3).

" Upon every head of cattle that is slaughtered before its first permanent incisor is up, a tax of 2 Lire (about 1*s* 7*d*) is levied by the commune. Of the sum thus raised one quarter is left to the commune and the rest devolves to the State " which devotes it to the objects set forth in art. 3 of the present law. (Art. 4).

331 - Institution of a General Inspectorship of Agriculture in Tunis.

Institution d'une Inspection Générale de l'Agriculture en Tunisie. — *Journal Officiel Tunisien*, Year 31, No. 14, p. 198. Tunis, February 15, 1912.

By decree of February 13, 1913, a General Inspectorship of agriculture for the technical agricultural services has been founded at the

General Direction of Agriculture, Commerce and Colonization. The Director General of Agriculture is charged with the execution of the decree.

VELOPMENT AGRICUL RE IN FERENT UNTRIES.

[illegible] – Agriculture in the Gold Coast.

Colonial Reports; Annual, No. 725: Gold Coast, Report for 1911, pp. 49. London, 1912.

Agricultural Exports. — The total value of all seaborne exports from the Colony during 1911 amounted to £3 792 454 against £2 697 706 in 1910.

The agricultural exports in 1911 were as follows:

	Quantity	Value £
Cocoa	88 987 324 lbs.	1 613 468
Cola Nuts	5 791 931 »	93 099
Copra	779 tons	13 257
Cotton, raw	9 701 lbs.	238
Concentrates	1 064 456 »	13 924
Guinea Grains	99 386 »	2 099
Gum Copal	80 042 »	1 110
Ivory	1 607 »	385
Lumber (Native timber) .	13 973 396 sup. ft.	138 821
Palm Kernels	13 254 tons	175 861
Palm Oil	1 610 209 galls.	128 910
Rubber	2 668 667 lbs.	219 417

The most notable increases in the value of exports are: cocoa (£746 897), cola (£15 383): and the most notable decreases are: rubber (£139 429), palm oil (£32 472). The cause of the decrease in the rubber export is assigned to the fall in prices in the European markets; the fall in the value of palm oil is explained by the attraction held out to farmers by the more easily won profits of the cocoa industry.

Lands — The bulk of land in the Colony belongs to the tribal "stools", and theoretically there is no land without an owner. The Crown possesses no waste land in the Colony, but certain lands have been acquired by the Government from time to time, mostly under the provisions of the Public Lands Ordinance, 1876, which legalises compulsory acquisition for the services of the Colony on payment of reasonable compensation. Of recent years deeds have come into common use, especially in land transactions between natives and Europeans.

Agriculture. — Agriculture is the staple industry of the interior. The chief food crops are yam, cassava, maize, amankani (a species of eddo), and plantain. The most important cultivated product grown for export is cocoa. The industry is almost entirely in the hands of native farmers. Agricultural stations in charge of European curators are established at Aburi, Tarquah, and Assuantsi in the Colony, at Coomassie in Ashanti, and at Tamale in the Northern Territories. European and native instructors under the control of the Director of Agriculture are constantly travelling and advising the native farmers as to the cultivation and preparation of the various products of the soil.

Reports on the following subjects were furnished by the Imperial Institute to the Government of the Gold Coast during 1911. A sample of Nyasaland Upland cotton grown at Labolabo was of good quality, although rather uneven in strength. Recommendations were made regarding the acclimatation of this cotton in the Gold Coast. A sample of native cotton from the Dagomba District of the Northern Territories was of excellent colour but somewhat harsh and rather short. Three samples of imperfectly prepared Hibiscus fibre were received from Tamale. These fibres would be saleable as substitutes for jute, but they are inferior to the latter fibre on account of their interlacing character. Botanical specimens of the plants yielding these fibres were identified at Kew as *Hibiscus sabdariffa* L. *H. cannabinus* L., and *H. squamosus* Hochr.

A sample of Funtumia biscuit rubber prepared with formaldehyde contained a little more resin and protein than is desirable, but was otherwise of good quality, and was valued at 6s. 10d. to 7s. per lb. in London with fine hard Para at 6s. 11d. per lb. Samples of the roots and stems of three gutta-yielding plants were examined, but only one of them contained sufficient gutta to make extraction on a commercial scale worth consideration. The roots and stem of this plant contained respectively 11.35 and 2.10 per cent. of gutta.

Five samples of cocoa which had been prepared by different methods were received for valuation; the fermented cocoa was regarded as superior to the unfermented samples (1),

Samples of cola nuts derived from *Cola acuminata, C. Johnsonii* and *C. verticillata* were found to contain respectively 2.1, 0.8, and 0.8 per cent. of total alkaloid, expressed on the dried nuts. This sample of *C. acuminata* is remarkable in containing a high percentage of caffeine.

Botanical specimens of the plant yielding "Baco" or "Abaku" nuts were identified at Kew as *Dumoria heckeli*, A. Chev.

333 - Agriculture in Indo-China in 1911.

L'agriculture en Indo-Chine en 1911. — *Ministère de l'Agriculture, Direction de l'Agriture, Bulletin mensuel de l'Office de Renseignements agricoles*, Nos. 11 and 12, pp. 1493-1509 and 1715-1727. Paris, November-December 1912.

I. *Cochin-China.* — Over a large extent of this country, rice, which is the chief crop grown, depends on the rain for its irrigation; in consequence, years or irregular rainfall of with prolonged periods of drought result in poor harvests or famines (2). In the provinces of Baclieu and Rachgia, where the soil is very fertile, but consists of recent alluvium (and thus only productive if the rainfall is regular and abundant), the [illegible] network of irrigation canals, already very extensive, is being gradually increased, although slowly owing to the laborious nature of the task. When these irrigation works are finished a vast tract of land will be turned to account.

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(1) See No. 1301, *B.* Sep. 1912. (*Ed.*).

(2) See No. 1612, *B.* Dec. 1912. (*Ed.*).

Owing to the uncertainly of the rice yield, the natives are turning their attention more and more to growing other crops. Plantations of maize, sugar cane and fruit trees are constantly increasing, especially in east Cochin-China; maize has also been grown successfully in the province of Chaudoc. The plantations of pineapples, sugar cane, mangostan, areca nuts and mangoes in the province of Thudaumot produce an abundance of fruit, which is much appreciated in the markets of Saigon and Cholon, and which is even beginning to be exported to China and Singapore. The sugar cane suffers much from the attacks of insect larvae; and only yielded a poor crop in 1911. Pepper tree plantations exist on the Hong-Chong and Phuquoc district, as well as in the province of Baria. The following crops are also cultivated in Cochin-China: tobacco, sweet potatoes, haricot beans, vegetables, betel, coffee, indigo, manioc, mulberries, earthnuts, etc. In the province of Gocong, an attempt has been made to grow coconuts.

Native colonisation is increasing steadily. In one year 37 000 acres have been granted in concessions between 25 and 1 200 acres, and 12 000 acres in concessions of from 1 200 to 7 500 acres. Some of the central provinces are at present entirely under cultivation. The natives are now turning their attention to the immense tracts of uncultivated land situated in the provinces of Rachgia, Baclieu, Cantho, and Soctrang.

European colonization, though almost stationary in the western provinces, tends to develop increasingly in the east. In a few months over 75 000 acres of the State land have been sold in the province of Bienhoa alone, for the purpose of making *Hevea* plantations. The large plantations of rubber trees belonging to Europeans are over 50 in number and cover 150 000 acres of red land and 34 500 acres of grey land (loam). There are already 830 000 trees on the red land and more than a million on the grey. Ong-yêm rubber met with the approval of the judges at the recent exhibition in London and this has given rise to many requests for it.

The future of colonization in Cochin-China chiefly depends on the solution of the labour problem, the local supply being clearly inadequate. By a decree of March 14, 1911, a Commission of planters was appointed to consider suitable means for promoting immigration to Cochin-China and to study the establishment of Colonizing Bureaus.

For the last two years, attempts have been made to remedy this scarcity of labour by the use of agricultural machines (1). Hitherto the results obtained have not been very conclusive, as the tackle employed was too heavy, and sank in as soon as the soil was a bit damp. It is necessary to devise a light type of machine, working a narrower strip of ground. The use of machines requires a dry compact soil; to attain this, excess of water (whether rainwater, or due to tidal floods) must be prevented and attention paid to hoeing and ploughing, practices usually neglected by the native. An association has lately been formed for the solution of the question of mechanical cultivation in Cochin-China.

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(1) See No. 121, *B.* Feb. 1913. (*Ed.*).

Injury done by insects, birds and rats, especially the two last, is always to be feared. The attempts made to find an efficacious means of controlling rats have proved abortive.

The admnistration continues its measures for the destruction of the floating plants or "luc binh" (*Eichhornia crassipes*) (1), which threatens to prevent the traffic on a large number of the water-ways and have even invaded the rice-fields at some places, Numerous groins made along the course of the rivers and canals, caught 235 100 cub. ft. of "luc-binh" in January, 323 200 cub. ft. in February and 434 200 cub. ft. in March. The results of this system being so satisfactory, it will be generally adopted throughout Cochin China.

II. *Tonking.* — The Agricultural and Commercial Services have heen increased and reorganized by the decree of April 7, 1910. An attempt is being made to provide the natives with technical instruction, especially in reeling and weaving silk, plaiting hats and mats, etc. The Experimental Stations of Than-ba and Phu-lang-thuong distribute selected silkworm eggs. At the Than-ba Station certain diseases of coffee are being studied at present, as well as the prevention of ravages caused by insects, the improvement of native cultivation by means of seed selection, and the cultivation of maize, rice and sugarcane. At La-pho, textile and oleiferous plants are under investigation, while the Phuxa Station of Agricultural Hydraulics is occupied with the question of manuring rice. The Stock-breeding establishments of Hanoï and Nuoc-hai have continued breeding native horses and cross-breds. Horse-breeding has increased much in the mountainous district. At Hanoï sheep-breeding is practised with much success, some of the animals coming from the Malay peninsula, others from Java. Where breeders have been provided with sheep, *e. g.* at Sontay, Chobo and Bac-Kant, the animals have proved to be strong and disease resistant, and to provide good meat.

The exports of rice and maize are on the increase. The cultivation of European food plants and fruit trees is also increasing, even far from the great centres.

The budget of 1911 reserved 156 823 acres of forest, which bring sup the total area of reserved forest land to 337 012 acres. In 1910, 1 493 344 cub. ft. of timber were felled and 1 725 624 cub. ft. of wood were burnt for charcoal, as against 1 422 745 cub. ft. and 1 010 172 cub. ft. respectively in 1909.

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(1) See No. 1390, *B.* May 1911; No. 1167, *B.* Aug. [illegible] (*Ed.*).

The irrigation works, begun in 1898. are now extended to the whole delta. With a view to obtaining precise information as to the greatest advantage which can be expected from irrigation, an experimental field has been made (in accordance with the provisions of a decree dated November 3, 1909) in the districts of Phu-xa and Phu-gia (Hadong province). The results hitherto obtained point to the advisability of the diminution of the irrigation coefficient adopted for the Kep canal, and show that irrigation alone, together with the ordinary native methods of cultivation, is sufficient to produce average crops in districts, in which, at certain times of the year, nothing could before be raised. They also show that chemical manures, when used on the rice fields cultivated by the natives, do not as a rule give appreciably higher returns.

III. *Annam.* — Tobacco is chiefly grown in the provinces of Thanh-hoa, Vinh and Dong-hoi; cinnamon in Than-hoa and Quang-nam (wild cinnamon becomes increasingly rare); tea is much cultivated in Quang-nam and Binh-dinh, and rubber in the province of Hatinh. The cultivation of coconut palms is encouraged.

In 1911, the total area colonised by Europeans was 97 600 acres (4 080 acres more than in the preceding year), and the total of the cultivated area was 25 450 acres.

The propagation of *Ficus elastica* has been continued on a large scale; many slips have been taken from young trees raised from seed brought from Saigon; these succeeded perfectly, which was not the case when slips were used from the local Annam variety: this can only be propagated by layers. From May until the end of August, incisions were made in trees of *Ficus elastica* of from 7 to 8 years of age and with an average circumference of 32 inches at a height of 3 ft. 3 in. from the ground. These trees had never been tapped before, and 330 gr. of smoke coagulated rubber per tree was obtained. Acclimatization experiments with Venezuelan Kapok are being successfully prosecuted, especially at the Yendinh Station. This same Station introduced in 1906 Kelantan sheep, which have become perfectly acclimatized. The various Annam Experiment Stations distributed from June 1910 to July 1911, 296 226 layings of selected silkworm eggs.

IV. *Cambodia.* — The sericultural services is making rapid progress; in 1910-11, 121 851 layings of selected silkworm eggs were distributed (more than double the amount distributed in the previous year) the average weight of the native cocoon has increased in seven generations from 643 mgr. to 1 200 mgr.

Rice, pepper, tobacco, maize and cotton are the principal crops; the cultivation of maize is making rapid progress. Stock breeding is one of the chief sources of revenue of the country.

V. *Districts of Kouang-Tchéou-Wan.* — The principal crops are as follows: earthnuts, (increasing very fast — the demand exceeding the supply), potatoes, sugar cane, hemp, cotton, mulberries and sweet potatoes, which are the chief article of food consumed by the natives. Many rushes are exported, either made into mats and sacks, or in the form of packing material. Selected silkworm eggs from the Sericultural Station of Phu-lang-thuong have been introduced into this district, silkworm rearing has been very successful, and the silk, though rough on account of the primitive methods employed, is of good quality. The Administration is engaged in promoting silkworm rearing among the natives.

334 - Agricultural Production of New Zealand in 1912.

New Zealand Department of Agriculture, Commerce and Tourists. Annual Report 1912, pp. 229 + figs. Wellington, N. Z., 1912.

Agricultural production.

Total area of the Dominion (including the Chatham and other islands) 66 791 680 acres.

Area in occupation (1910-1911).

	Acres
Crops	1 729 504
Fallow Land	209 973
Sown grasses; Land ploughed	5 000 226
» not ploughed	9 214 515
Native grasses, etc.	23 972 236
Orchards, Plantations, Gardens, etc.	111 672
Total area in occupation	40 238 126

Area under Cultivation (1910-1911).

	Acres
Corn and Pulse Crops	1 015 822
Green Crops.	713 682
Sown Grasses	14 214 741
Fallow Land, Orchards, Plantations, Gardens, etc.	321 645
Total area under cultivation	16 265 890

Number of Holdings (*1 acre and over*) (1910-1911) . . . 73 876

Area under different Crops.

Corn and Pulse Crops	1910-1911	1911-1912	Green Crops	1910-1911	1911-1912
	acres	acres		acres	acres
Wheat	336 389	215 528	Potatoes	29 023	28 248
Oats	593 396	403 668	Turnips	450 959	440 202
Barley	38 131	31 644	Mangolds.	14 082	19 764
Maize	18 857	6 094	Rape	208 057	213 691
Peas and Beans	17 336	—	Carrots	2 363	—
Hops, Rye, Vetches, Linseed, etc.	11 713	—	Beet	279	—
			Other Green Crops	8 919	—
Total	1 015 822	—	Total	713 682	—

Live-Stock, 1911.

Horses	404 284
Cattle:	2 020 171 (633 733 Dairy cows).
Sheep.	23 996 126 (1 819 339 Merinos; 22 176 787 Longwools)
Pigs	348 754
Angora Goats	6 119

Number of animals slaughtered in 1912.

	At ordinary slaughterhouses	Under inspection	
		Abattoirs, etc.	At Meat export Slaughterhouses
Cattle	67 680	85 687	69 654
Calves	1 285	10 262	3 128
Sheep	313 285	591 068	2 285 174
Lambs	38 150	103 410	3 050 548
Swine	56 392	154 206	21 493

Agricultural Exports in 1912.

	Quantity	Value £		Quantity	Value £
Wool . . . . . lb.	182 883 067	6 579 074	Hemp . . . . . tons	18 094	310 884
Butter . . . . . cwt.	327 282	1 776 440	Tow . . . . »	2 823	23 289
Cheese . . . . . »	463 610	1 297 088	Timber . . . sup. ft.	95 710 967	468 181
Lamb . . . . . . »	1 167 980	1 750 236	Kauri-gum. . . tons	6 952	368 228
Mutton . . . . »	1 068 881	1 197 594	Fungus . . . . cwt.	2 925	6 136
Beef . . . . . . »	500 022	250 304	Wheat . . . . bu.	1 123 730	197 623
Salted beef . . »	11 929	13 303	Oats . . . . . . »	314 254	37 502
Live-Stock.	16 364	190 685	Barley. . . . . »	133 604	29 229
Preserved Meats cwt.	64 642	130 433	Beans, peas and maize . . . . »	275 949	66 731
Rabbits and Hares »	91 546	78 041	Bran and pollard tons	1 235	5 901
Bacon and Hams »	2 566	6 538	Seed, grass and clover . . . . cwt.	18 396	40 011
Hides	174 106	159 835	Flour . . . . . tons	167	1 403
Sheep and Rabbit skins	17 650 180	676 407	Hops . . . . . cwt.	1 874	11 594
Tallow . . . . tons	25 821	506 373	Potatoes. . . . tons	1 307	6 439
			Chaff, hay and straw . . . . »	166	1 115
Sausage-skins (casings) . . . . cwt.	24 516	66 801	Fish and oysters. .	—	33 989

Field experiments in cooperation with farmers are decidedly popular. The Department of Agriculture, in consultation with the farmer, sets out the place and supplies seed and fertilizers. The farmers provide the land and the labour and receive in return the crops; the experiments are supervised by officers of the Department. In 1912 the number of farmers who participated was 400, and the number of plots 5205. The experiments embrace a number of combinations of fertilizers and many plants, especially fodder plants and cereals, and they have shown among other results that silver-beet is an excellent forage plant and that lucerne deserves to be much more widely grown in New Zealand.

Experiments are in course for regrassing the vast areas which have been denuded by fire, overstocking, and by rabbits in Central Otego, in the Mackenzie region, in the pumice lands of the central part of North Island, and in the gum lands of North Auckland. The first have been enclosed with a wire netted fence to ensure control of rabbits, and a proportion of each has been sown to various grasses; the most promising results were obtained with cocksfoot, "chilian fescue" (*Festuca dumetorum*) and common couch.

The Government has offered a bonus of £12 000 to reward inventors who may provide improved machinery for the preparation of the fibre of the New Zealand hemp (*Phormium tenax*); this is at present effected by a machine which has hardly been modified for half a century.

Manawatu is the most important district in the production of this hemp, and Toxton is the largest grading station. In 1912 it turned out 36 892 bales (against 33 176 in 1911) and 9 457 bales of tow (against 7 829 in 1911).

The average prices of New Zealand hemp during 1911-12 were: good-fair, £17. 5s per ton; fair, £16 5s per ton. Tow: first, £8 5s; second, £7 10s; third, £6 15s oer ton. All the above prices f. o. b. Wellington.

The area under orchards is rapidly increasing: it was about 36 000 acres in 1912, against 34 000 in 1911 and 28 500 in 1908. Vineyards occupied 779 acres in 1911 and 663 in 1908-9. Of late years the grading and packing of fruit have improved very much; this is in a great measure due to the instruction in these subjects provided by the Department. Cool storage of fruit is growing in favour. Co-operative fruit-testing plots have been planted. There is a great demand for apples for export and it is anticipated that this branch of exportation will soon develop considerably; the government encourages the planting of apple orchards. In the fiscal year ending March 31, 1912, New Zealand exported £3 334 worth of fruit and imported £441 387 worth.

In 1912 twenty new factories were built in New Zealand for the manufacture of cheese, seven for the making of butter and one for the production of casein, the first in the Dominion.

The practice of systematically testing cows' milk for butter-fat throughout the whole year has rapidly spread since the Department of Agriculture founded several cow-testing associations.

A number of cheese factories pasteurize the whey before returning it to the suppliers of milk, with the object of avoiding the spread of tuberculosis in calves and pigs.

In some cases New Zealand butter has been found to develop a "fishy" flavour. It has been demonstrated that fishiness is very apt to develop when the cream from which the butter was made contains too high a percentage of acidity, that is, more than 0.3 per cent. in cream containing 40 per cent. of butter fat.

In Great Britain, and in New Zealand and some other countries, legal enactments provide that butter shall not contain more than 16 per cent. of water; the Commonwealth of Australia has recently fixed the limit at 15 per cent.; 1985 samples of butter were tested for water at the various grading posts and the average water content was found to be 14.25 per cent.

The following table shows the number of bee-keepers and hives, with the quantity of honey and wax produced during the year as ascertained at the census of 2nd. April, 1911.

Number of Persons keeping Bees	Number of Beehives	Honey produced during Year	Beeswax produced during Year
11 002	71 584	1 457 272 lbs.	28 061 lbs.

Taking 5*d*. per pound for the honey and 1*s*. 3*d*. per lb. for the wax, the value of the output for the year would amount to £32 113 12*s*. 11*d*. The honey exported for the twelve months ended 31st. March 1912 was 115 759 lbs., valued at £2 255.

At the Wallaceville Laboratory, among other work, experiments have been carried on in the direction of ascertaining the effects of ergot on livestock, with the result that sheep did not show any sign of ergotism while cattle were affected.

Other investigations were made on bush sickness. All the evidence gathered points to the condition being one of malnutrition rather than disease, and that probably a deficiency of available iron is the cause of the trouble. The disease disappeared from the pumice land pastures where it had been rife when these were top dressed with soluble iron salts and with phosphates.

Protection of agricultural produce. — One of the greatest pests of agriculture in New Zealand is the rabbit. In the settled districts and on the land under the administration of the Rabbit Boards of Hawkes Bay and of the East Coast the rabbit nuisance is under control. The business of trapping for export is firmly established in some districts and in others poisoning is practised.

The two most injurious weeds in New Zealand are the blackberry and the Californian Thistle. It is hoped to control the first by means of a native insect belonging to the genus *Tortrix*, and the second by parasitic fungi. During the year numerous specimens of the following weeds were sent in from various parts of the Islands: Mediterranean rocket (*Eruca sativa*), black mustard (*Brassica nigra*) and lantana (*Lantana camara*).

Systematic spraying for the control of insect and fungus pests is compulsory by law. Woolly aphis and apple and pear scab in orchards, wheat black-mould, wheat mildew and grass rust in wheat, and Irish blight in potatoes have been reported.

The inspection of all fruits, plants, vegetables, etc., that are imported is compulsory.

335 - Importation into Germany, in 1912, of Produce from the German Colonies.

Die Koloniale Rohstoffversorgung des Deutschen Reiches. — *Deutsche Kolonialzeitung*, Year 30, No. 6, p. 86. Berlin, February 8, 1913.

The following data are taken from the official statistics (*Amtliche Reichsstatistik*, December 1912).

Colonial Products	Importation into Germany from all countries 1912	Importation from the German colonies		
		1912	1911	Colony
	lbs.	lbs.	lbs.	
Coffee	385 808 500	385 808	1 212 541	German E. Africa (Usambara).
Cacao	121 254 100	(1) 2 733 729	3 262 838	Togo; Kamerun; Samoa.
Cotton	(2) 1 102 310 000	2 866 006	—	German E. Africa; Togo.
Sisal hemp . . .	7 072 421	5 004 487	—	German East Africa.
Rubber	(3) 45 415 172	257 058	—	Togo.
		4 505 141	—	Camerun.
		1 887 816	—	German East Africa.
Cedar Wood . . .	(4) 12 191 549	837 756	—	» » »
Mangrove-bark . .		3 152 607	—	» » »
Copra	404 014 252	15 803 106	—	German Australasia (Samoa excluded).
		4 830 322	—	Samoa.
Coconut kernels .	576 298 691	34 467 029	—	German Africa.
Palm oil	31 268 125	568 792	—	» »
Earthnuts	154 323 400	440 924	—	» »

(1) Worth about £ 188 000.
(2) » » » 24 600 000.
(3) » » 8 568 000.
(4) 11 353 793 lbs. imported from America.

336 - Export of Danish Agricultural Products in 1912.

The Danish Export Review, Vol. XVIII, No. 1, pp. 3-4. Copenhagen, January 1913

The following figures are supplied, by the State's Statistical Bureau'

Butter, Cream and Milk.

	1912 Million lbs.	1911 Million lbs.	Average price for 1912
	—	—	—
Butter	over 187*	197	1s. 1*d.* per lb.**
Cream . . .	little under 60	44	
Milk	over 18.7	23	

* Of which about 6.6 mill. lb. packed in tins.
** About 3 % higher than in 1911.

In the ordinary form of packing barrels the following quantities of butter were exported in 1912:

about 169 ½ million lbs. to Great Britain.
somewhat over 5 ½ million lbs. to Germany.
» » 6.6 » » » Austria.

In 1911, 1910, 1909 and 1908 the butter export to Great Britain was respectively 178,9 181,5, 184,1 and 187,2 million lbs. For the same period of time England's total consumption of butter from abroad or from her colonies taken as a whole has been diminishing or keeping stationary. The export of cream and milk is confined to Germany; the export of butter in tins takes place chiefly to transatlantic and other distant countries. About 19 per cent of the total export from dairy farming, which represents a butter quantity, of about 200 million lbs., went to countries other than Great Britain; some years ago the equivalent percentage for other countries only amounted to about 5 per cent.

Pork and Bacon.

	1912 Million lbs.	1911 Million lbs.	1910 Million lbs.	1909 Million lbs.	1908 Million lbs.	1907 Million lbs.
Fresh pork	14.3	—	—	—	—	—
Bacon	262.9	—	—	—	—	—
Salted pork in barrels	4.4	—	—	—	—	—
Totals	281.6	251.9	213.4	209	239.8	212.3

Offals:

Export in 1912.

	Million lbs.
Heads and feet of pigs	16.5
Hearts, liver and plucks	9.9
Guts	12.1
Stomachs	3.3

The principal quantity of the exported meat from pigs is prepared as "bacon" *i. e.* lightly salted pork in bales. Towards the close of 1911 there began a comparatively important rise in the export of fresh pork, which in 1912, 1911 and 1910 was respectively 14.3, 3.3 and 1.1 million lbs. The bacon export goes entirely to England, but only 2.2 millions lbs. of fresh pork went to that country; the chief quantity going to Switzerland, Germany and Holland. Whilst in 1911 only 5.5 million lbs. of bacon went to countries other than Great Britain, in 1912 about 16 million lbs. were exported to other countries. The export of offals is also rising as regards the total export value.

Cattle and Beef.

Exports.

	1912	1911	1910	1909	1908	
Live cattle	125 000	153 500	140 800	124 000	121 600	heads.
Beef and veal	57.7	28	36.3	34.1	24.2	million lbs.

The large import in 1911 of about 29 000 head of Swedish cattle, which was principally slaughtered for export, was diminished in 1912 by 8000 head, so that the export surplus has risen considerably more than the actual export. All the live cattle, with the exception of some 800 to 900 head which were sent to Russia, went to Germany. The beef was exported to:

	1912 million lbs.	1911 million lbs.
Germany	49.5	20.9
Switzerland	3.3	4.4
Norway	3.3	1.1
Great Britain	1.7	1.1

Horses.

Exports.

1912	1911	1910	1909	1908
24 900*	28 500	26 100	22 700	18 600

* About 22 500 horses and 2400 foals.

The import of foreign horses for the last three years was about the same, namely 14 to 15 thousand.

Eggs.

Exports (in million score).

1912	1911	1910	1909	1908
over 19	21.5	20.5	over 19	over 21

The decline in the egg export in 1912 is due to the cold winter and spring months of 1912. About 5 per cent of the export in 1912 went to countries other than Great Britain.

The agricultural products mentioned in this article represent between 4/5 and 5/6 of the entire export. In 1011 its value represented over £23 967 000, whilst other agricultural goods and goods not of agricultural origin were exported for about £5 500 000. The estimated value for 1912 for the above-mentioned articles shows a rise of about £1 600 000; for each of the two preceding years the rise was about the same. Higher average prices for the year have been paid for nearly all the products derived from Danish domestic animals.

337 - Exportation of Agricultural Produce from the State of Rio Grande do Sul, Brazil.

MINSSEN, G. Alguns aspectos do Rio Grande rural em 1912. — *Estado do Rio Grande do Sul. Boletim Technico da Secretaria de Estado dos Negocios das Obras Publicas*, 1912, No. 5, pp. 193-211. Porto Alegre.

These are: comparative statistics for 1910 and 1881 of the exportation of the principal agricultural products, a summary description of the various regions of the State, of the condition of the principal crops, of stock breeding, and of animal industries.

Exports in 1910 (*).

Vegetable products	£	animal products	£
Maté	200 500	Dried meat . . .	1 745 692
		Hides	1 021 150
Manioc flour .	196 651	Tallow	340 800
Tobacco . . .	172 125	Lard	229 200
Beans	586 350	Milk	183 641
		Canned meat . .	122 675

(*) The milreis is valued at 18 *d* (The average value of the milreis in 1909 was 17 3/4 *d* *The Statesman's Year-book for* 1912, p. 680). Maté to the value of £ 915 110, tobacco. worth £ 1 609 785 and skins and hides for £ 2 418 107 were exported from Brazil in 1910. *Ibid.* p. 679). . (*Ed.*).

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

338 - The Organisation and Present Condition of Agricultural Instruction in Belgium.

VANDER VAEREN, JULIEN. L'organisation et la situation actuelle de l'enseignement agricole en Belgique. — *Revue des Questions scientifiques*, Series III, Vol. 23, pp. 237-271. Louvain, January 20, 1913.

After a short review of the historical development of Agricultural Instruction in Belgium, the writer describes its present organization. He first of all draws a distinction between two large divisions of agricultural schools; those for youths and boys and those for girls. In both, the grades of instruction are different: there are colleges for young men, and similar institutions for girls, agricultural secondary schools of higher and lower grade and also higher and lower elementary schools.

Belgium possesses two agricultural colleges, the Agricultural State Institute of Gembloux and the Agricultural Institute of the University of Louvain. In order to be admitted at either as a regular student, it is necessary to have completed the intermediate course of studies and, further, to have passed an examination in mathematics. The course of study is three years at both Institutes; after this comes a fourth optional year, during which the student can pursue his studies further in one of the following branches: 1) Agriculture and Instruction; 2) Agricultural Chemistry and Industry; 3) Forestry. On passing the examination at the close of the three years' course, the student receives the title of "ingénieur agricole". The Gembloux Institute, which opened in 1861 with 37 students, had 175 in the session 1911-12; while the Louvain Institute had 200 students in 1910-11, as against 15 in 1878 when it was opened.

As agricultural intermediate schools of higher grade, the writer mentions the free Agricultural Schools of Carlsbourg, La Louvière and Leuze, and the State School of Practical Agriculture at Huy. In these are educated agents for medium-sized farms, smaller agricultural industries, etc. The course in the two first lasts for three years, but is only two years in the Huy Institute. The students must have been through a higher grade elementary school or an intermediate lower grade school. The teaching staff is chiefly composed of "Ingénieurs agricoles". In 1910-11, the number of students was as follows: Carlsbourg 52; La Louviere 29; Leuze 97; Huy 29, in all therefore 207.

The 26 agricultural divisions, which are attached to free colleges, intermediate schools, etc., are agricultural intermediate schools of lower grade, as is understood by the writer. Their curriculum includes all agricultural subjects; these are mostly taught by "ingénieurs agricoles". The course in these schools is also a three years' one. The students are liberally supplied with apparatus and materials, 30 to 50 per cent of the cost of these being defrayed by the State. The number of students in these schools rose from 275 in 1900 to 822 in 1911. The writer lays special stress upon the fact that in these schools, as in the previously mentioned Institutes, no instruction is given in practical agriculture, for the students, being mostly peasants' sons, acquire practical experience on their fathers' farms.

The writer considers the following as elementary agricultural schools of higher grade:

1. "Sections professionnelles agricoles primaires" (Professional agricultural Schools). 2. "Sections professionelles ambulantes" (Agricultural travelling schools). 3. Schools, sections and courses of instruction in agricultural machinery. 4. The Agricultural course of instruction in the State institutions and free institutions. Today there are 28 "sections professionelles agricoles primaires", which might well be entitled agricultural winter schools: these are opened every week for 2 or 3 afternoons during 3 or 4 winter months, when the schools are independent, or for 2 to 3 ½ hours on 3 to 5 evenings, if the school is attached to an elementary school.

The curricula of these schools must, as far as possible, be suited to the requirements of the district. The teachers are, in many cases "ingénieurs agricoles", but they are usually elementary teachers, who possess a certificate for agricultural instruction. In 1911-12 the number of students was 1062.

Travelling agricultural schools were first started in 1904; there are now ten of these in Belgium. Instruction is also given in these schools only during the winter months and generally by specialists, such as "ingénieurs agricoles", veterinaries, experts in agricultural machinery, etc.

Hitherto they have been attended by 25 to 40 farmers of from 17 to 35 years of age.

Belgium has three schools of agricultural machinery, at Mons, Leuze and Namur. The course is held in the winter months and lasts one winter at Mons and Namur and two at Leuze. The instruction is both practical and theoretical. Most of the teachers are "ingénieurs agricoles".

In the winter 1911-12, 50 students attended at Mons, 81 at Leuze, and 25 at Namur, this being the first year of the existence of the school.

In the Fleurus and Avelghem agricultural machinery departments, which are attached to other Institutes, 22 and 30 students respectively received instruction during the same winter.

In the provinces of Brabant and Liège there have been 4 travelling schools of agricultural machinery for a year; and during this first year they were attended by 22 or 23 students on an average.

In the provinces of Limburg, Namur and Luxemburg several courses of from 10 to 15 lectures with demonstrations were held on agricultural machinery; these were attended by 20 to 50 students each.

In 50 State schools and in the same number of free intermediate schools, one or two hours have been devoted weekly to agricultural science; these were attended by 2862 scholars during the school year.

The writer considers that the numerous lectures on different branches of agriculture constitute arrangements for lower grade elementary agricultural instruction. These are held in villages especially during the winter, by State agriculturists, "ingénieurs agricoles", agricultural teachers, etc.

The 116 agricultural libraries, and the free information supplied to the farmers by the experiment stations and State agriculturists are also mentioned.

Since 1911, special agricultural instruction for training country housekeeping teachers has been given in the fifth optional year at the Teachers' Colleges of Wavre-Notre-Dame and Héverlé. Belgium possesses 14 country house-keeping schools with a two-years' course; these were attended in the school year of 1911 by a total of 436 pupils. The 5 departments for country housekeeping, which were attached to other Institutes, had 99 pupils during the same year. Further, there are 13 travelling housekeeping schools, which give a 3 to 4 months' practico-theoretical course in different districts. So far, departments of instruction in country housekeeping are only attached to 10 elementary schools.

In addition, during the last 10 years numerous lectures have been given to the female agricultural population on agricultural subjects especially interesting to women.

In the teachers' colleges, which are under the administration of the Ministry of Arts and Sciences, the study of agriculture is obligatory in the third year, as the curriculum of the elementary schools includes one or two hours' weekly instruction in this subject. Vacation courses are held annually from August to September in the Teachers' Seminaries of Nivelles and Ghent; the teacher who attends these and passes an examination in the Easter holidays, obtains a certificate "of competency for imparting instruction in agriculture".

In conclusion, the writer mentions that the authorities of the province of Hainant opened a school in 1911 at Ath for agriculture and stock-breeding; the course is a three-years' one. The province of Brabant in 1911-12 opened two more winter schools at Court-St-Etiénne and Tirlemont; these were each attended the first year by from 25 to 30 students.

339 - The New Bill for the Advancement of Agricultural Instruction in Canada.

Communicated by T. K. DOHERTY, *Commissioner of the International Institute of Agriculture in Canada.*

A Bill of the greatest importance to agriculture in Canada was introduced in the House of Commons on January 24th, 1913, by the Hon. Martin Burrell, Minister of Agriculture. The new measure is the practical application of the "Agricultural Aid Act" passed in April, 1912, giving power to the Governor-in-Council to make grants to the Provinces for the encouragement of Agriculture.

On the passing of the Act in Aid of Agriculture, Dr. C. C. James, Deputy Minister of the Ontario Department of Agriculture, was appointed to investigate agricultural conditions in Canada and ascertain in what way the federal authorities could best assist the provinces in developing Canada's basic industry. Dr. James has consulted with the provincial governments and with the men in charge of the various agricultural institutions of the country and the results of his work is the new Bill now before the House of Commons.

The new law is "for the purpose of aiding and advancing the farming industry by instruction in agriculture." The money voted to the provinces under it will be devoted exclusively to agricultural education. The object of the Act is to increase the efficiency and equipment of the agricultural colleges, establish agricultural schools, dairying and horticultural schools, and short courses in agriculture, and to initiate agricultural teaching in the public schools and work by travelling or located qualified instructors. Educational work will also be carried on by means of demonstration trains and the training of teachers in domestic science and nature study.

According to the terms of the new Bill $10 000 000 are to be given to the provinces to be expended on agricultural education during the next ten years. 700 000 will be allotted the first year and this amount will be increased by $100 000 annually until 1917, from which year until 1923 $1 100 000 will be provided yearly.

Speaking broadly the division of the money among the provinces will be on a population basis. There are, however, slight modifications of this principle. In the first place, $20 000 a year is to be set aside to be divided among such veterinary colleges as grant degrees and come up to a required standard. In addition $20 000 will be allotted to each province regardless of population. With the exceptions mentioned, the provinces will share as follows:

	1913. —	Yearly Increase.	1917-23. —
Prince Edward Island	$ 26 529.85	$ 1 306	$ 31 753.73
New Brunswick	44 509.93	4 902	64 117.87
Alberta	46 094.95	5 219	66 970.91
British Columbia	47 334.76	5 467	69 202.57
Manitoba	51 730.05	6 346	77 114.09
Nova Scotia	54 288.45	6 858	81 719.21
Saskatchewan	54 296.29	6 859	81 733.32
Quebec	159 482.40	27 896	271 068.32
Ontario	195 733.32	35 147	336 319.98

It is provided that if in any year any province is not prepared to use all its grant, the unused remainder shall be held by the Dominion for future use by that province, or until such time as it can make good a claim, or show good cause for its payment. If from lack of educational machinery, or for any other reason, any province is not able to submit a satisfactory scheme, the Federal Government would be prepared to formulate one for such province's assent.

340 - The Land Cultivation Commission and the Land Cultivation Office in Schleswig-Holstein.

AGRICULTURAL INSTITUTIONS

Landeskulturkommission und Landeskulturstelle in Schleswig-Holstein. — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 8, pp. 57-58. Berlin, February 24, 1913.

The province of Schleswig-Holstein has formed an organization for the reclaiming of waste lands and moorland; it is under the president of the Government district and in close connection with the Chamber of Agriculture.

The work of the *Land Cultivation Commission* consists in collecting and making known the results obtained in the cultivation of waste lands and in promoting efforts in this direction by means of advice and research; the *Land Cultivation Office* is occupied with the especially practical side of the question.

In the province of Schleswig-Holstein there still remain about 104 000 acres of waste land to be reclaimed, of which 82 000 acres are high-moors and 21 500 acres consist of mineral soil. About 9 300 acres of these areas are State property. Nearly 70 400 acres are about to be improved, including only 378 acres of high-moor. Hitherto over 240 000 acres of fen and of mineral soil have been improved at an outlay of nearly £1 323 000. The province will provide £2 940 in the new budget of the Ministry of Agriculture for the further promotion of the cultivation of the large areas of waste lands which still exist.

GRICULTURAL
HOWS AND
ONGRESSES

341 - Agricultural Exhibitions and Competitions in 1913.

Argentine Republic.

Sept. 1-18. Palermo, Argentina. — The "Sociedad Rural Argentina" will hold its yearly live stock show at Palermo from September 1 to 18, 1913. Besides live stock, the show will include forage of all sorts, fruit, vegetables, etc., produced in the country, as well as agricultural machinery and industrial plant, both national and foreign. Applications for admission are to be addressed to the Sociedad Rural Argentina: Buenos Aires, Florida, 316.

Nov. 9-12. Palermo. — The same association organises also: *A.* a fat stock show; *B.* a milch-cow show.

The first includes two divisions. 1. For breeders: *a*) cattle: Durham and crosses; Hereford and crosses; Aberdeen-Angus and crosses; other breeds; cross-breds; *b*) sheep: Lincoln and similar breeds; blackfaced and other breeds; *c*) pigs; *d*) poultry. The prizes offered are the following:

Prizes for each class.

	Championship	1st Prize	2nd Prize	3rd Prize	Mentions
	£ s	£ s	£ s	£ s	£ s
Cattle (individual)	43-17	43-13	35- 2	26- 6	11- 7
Sheep (groups of 5)	21-18	21-18	17-11	13- 2	8-15
Pigs	21-18	10-10	8-15	4-13	4- 7
Poultry	—	4- 7	3-10	2-12	17

Two championship prizes will be awarded to cattle: one to the best live animal, the other to the animal that has yielded most at the butcher's test.

2. The second division of the fat stock show is reserved to small farmers, and it is proposed thus to encourage the fattening of one or a few head of cows, pigs or sheep. There will be a championship prize of £87 14*s.* for the best head of cattle of all breeds, and prizes for the various classes about equal to those of the first group.

B. The show of milch-cows will include pure breeds and crosses. The cows must not be more than 7 years old and they must have stood the tuberculin test.

Austria.

May-October. Vienna. — Exhibition of the Austrian Adriatic Region. This exhibition is intended to acquaint the public with the history, the art and the production of the region. It will include, among other items, sections for agriculture, forestry and industries. For information apply to: "Arbeits Komitee, Oesterreichische Adria Ausstellung," Rotunde, Vienna.

May 11-16. Prague. — Exhibition organized by the Central Agricultural Association for the Kingdom of Bohemia. Address "Exhibition Committee, Central Agricultural Association for the Kingdom of Bohemia," Prague.

May 24-June 1. Vienna, at the Prater. — 32nd National Horse Show. Address: "Ausstellungsbureau", Schauflergasse 6, Vienna 1.

September. Vienna. — The Imperial and Royal Agricultural Association (K. K. Landwirtschaftsgesellschaft) of Vienna is organizing an exhibition of breeding and of production stock which will include sections for agricultural machinery and implements.

Belgium.

August 24-31. Antwerp. — Agricultural Show.

September 21 to 23. Manage, Hotel de Ville. — General Horticultural Exhibition. — Market gardening, Fruit-growing, Floriculture and connected Industries.

Canada.

July 8-13. Winnipeg. — Competition of Agricultural Motors connected with the Annual Exhibition of the "Canadian Industrial Exhibition Association."

August-September. Toronto. — Annual Canadian Exhibition. Address: Exhibition Department, City Hall, Toronto, Canada.

France.

April 11-18. Caen. — Annual Exhibition of the Poultry Association of Lower Normandy. Address: M. Langevin, Secretary, 72 Rue de Bayeux, Caen.

May. Lyons. — International Urban Show. Horticulture forms the 40th section and is divided into three classes: 1. Gardens; 2. Flowers; 3. Floral Decorations of Towns and Gardens. Address: Dr. Jules Courmont, Hotel de Ville, Lyon.

May 1-4. Saint Nazaire. — National Poultry Show organized by the Saint Nazaire Poultry Association. Address to the seat of the Association: Place Saint-Marceau, Saint Nazaire (Loire-Inférieure).

May 1-4. Bourges. — Poultry Exhibition of the Poultry Breeders' Association of the Cher. For information: M. Guerrier, banker, Bourges (Cher).

May 21-26. Paris. — General Exhibition.

May 25-June 1. Nancy. — State competition of the East of France organized by the French Horse Society.

May 31-June 5. Périgueux. — General Horticultural Show organized in connection with the seventeenth congress of the Friends of Roses, French Society of Rose-growers (June 1 to 3), by the Horticultural and Agricultural Society of the Dordogne. Address: Count de Lestrade, President of the Society, at Périgueux.

June 8-30. Bar-le-Duc (Meuse) — Exhibition organized by the Horticultural Society of Bar-le-Duc.

June 26-July 6. Vichy. — Competition of the South-East of France organized by the French Horse Society.

July 18-27. Boulogne-sur-Mer. — Competition of the North of France organized by the French Horse Society.

September. Jonville, Haute-Marne. — General Horticultural Exhibition organized by the Horticultural Society of the Haute-Marne.

October. Puiseux Farm, Seine-et-Oise. — Competition of Mechanical Tillage. Experiments organized by the Society of the Agriculturists of France under the patronage of the French Committee of Mechanical Tillage. Cultural and mechanical observations will be made. A sum of about £800 will be devoted to these experiments. There will be no classification nor awards; nevertheless some indemnities will be granted to makers and representatives who take part in the experiments.

November 8-15. Epinal. — Chrysanthemum and autumn product Show, organized by the Horticultural and Vine-growing Society of the Vosges. Address: the President, 1 Rue Thiers, Epinal.

November 19-23. Moulins. — Poultry Exhibition organized by the Poultry-breeders' and Agriculturists' Society of the Bourbonnais and of the Centre. Particulars: M. Buvat, President, 8 Avenue Victor Hugo, Moulins (Allier).

German South-West Africa.

May 24. — Agricultural Exhibition at Windhoek, German South-West Africa. The Exhibition will include: South African breeds of stock; dairy products; plant products; agricultural machines and implements. For particulars apply to the Geschäftsführenden Ausschuss für die Landwirtschaftliche Ausstellung, 1913, Windhoek, German South-West Africa.

Germany.

April 14-16. Munich. — Thirty-first market of Carriage, Saddle, Breeding and Draught Horses.

April 24. Berlin. — Exhibition of Fat Stock and Horse Show.

May 29-June 2. Königsberg. — Agricultural Show (Landwirtschaftliche Provinzial- und Jubiläumsausstellung). For particulars apply to Landwirtschaftskammer, Königsberg.

June 5-10. Strasburg. — Thirty-sixth Exhibition of the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft).

June 7-15. Breslau. — Fruit and Vegetables Show.

June 11-13. Cologne-Merheim. — Provincial Horse Show organized by the Chamber of Agriculture of the Province.

October 4-20. Dortmund, Westphalia. — Second Provincial Horticultural and Gardening Show. For applications for entries and for other particulars address "Geschäftsstelle des Obstbau-Verbandes" in Herford, Unter den Linden 7.

Holland.

July. Boskoop. — Horticultural Show.

Italy.

April 12-22. Casal Monferrato, Piedmont. —National Exhibition of typical Italian wines, organized by the Society of Italian Vine Growers.

May 10-19. Rome. — Villa Umberto I, National Flower, Plant and Fruit Show. For particulars address: Associazione nazionale italiana per il movimento dei forestieri, Sezione di Roma.

Portugal.

Lisbon. — International Poultry Show. For particulars apply to M. Manuel de Ameida e Castelno-Bramo, rua da Sociedade Pharmaceutica, 37, Lisbon, Portugal.

Russian Empire.

August to September. Khabarovsk, Amur Province, Siberia. — An Agricultural and Industrial Exhibition is to be opened at Khabarovsk in July or August 1913 for a period of two months. It is intended to present as complete a picture as possible of the actual condition of the Amur region and will include: Articles relating to the study of the geography, natural history, and economy of the region; produce of the farming, forest, mining, fishing, hunting, manufacturing and cottage and artisan industries; articles imported into and exported from the region, etc.

August to September. Jurieff, Livonia. — Two agricultural shows will be held at Jurieff in 1913. The first will be opened in August. For information, apply (in German) to the "Präsident des Nordlivländischen Ausstellungskomitets," Jurieff, Livland, Russia. The second, devoted especially to the peasantry, will be open from August 29 to September 1 and is organized by the Estnische Oekonomische Genossenschaft at Dorpat, Livland, Russia.

South Africa.

May 22-24. Agricultural Show at Pretoria.

May 30-31. Agricultural Show at Rustemburg, Transvaal.

June 4-5. Agricultural Show at Wolmaransstadt, Transvaal.

June 25-27. Agricultural Show at Pietermaritzburg, Natal.

July 2-4. Agricultural Show at Durban.

Spain.

May 21-26. The National Society of Breeders (Asociación general de Ganaderos) organizes a Stock Show and an Exhibition of National Dairy Produce; an Exhibition, open to foreigners also, of Agricultural Machines and Implements. For particulars apply to Secretaria de l'Asociación de Ganaderos, 30, Calle de las Huertas, Madrid.

Sweden.

May 15-September 31. Malmö. — Exhibition of the Baltic Countries. General and industrial exhibition with a section for agricultural machines. The exhibition is mainly devoted to the countries bordering the Baltic: Sweden, Russia, Germany and Denmark. For particulars apply to Styrelsen för Baltiska Utställningen, Malmö, Sweden.

United Kingdom (1).

April 14, 15. Dublin, Ball's Bridge. Spring Show of the Dublin Royal Society.

May 14, 15. — Newark Agricultural Show, Newark. C. T. Baines, Secretary, 52, Lombard-Street, Newark.

May 14-16. — Somerset County Agricultural Association, Taunton. W. R. J. Greenslade, Secretary, 3, Hammet-street, Taunton.

May 21-23. — Devon County Agricultural Association, Barnstaple. E. R. Callender, Secretary, The Warren, Starcross, South Devon.

May 28,29. — Leicestershire Agricultural Society, Victoria Park, Leicester. P. L. Kirby, Secretary, 25, Horsefairstreet, Leicester.

May 28-30. — Royal Ulster Agricultural Association, Balmoral, Belfast. Kenneth MacRae, Secretary, Balmoral, Belfast.

June 3-5. — Herefordshire and Worcestershire Agricultural Society Hereford. T. H. Edwards, Secretary, Corn Exchange Offices, Leominster.

June 4, 5. — Northamptonshire Agricultural Society, Towcester. Entries close May 10. J. E. Lovell, Secretary, Harpole, Northampton.

June 10-13. — Royal Counties Agricultural Society, Windsor. F. Simmons, Secretary, Basingstoke.

June 24,25. — North-West of Ireland Agricultural Society, Lacky-road, Londonderry. Entries close June 4. Oliver Bond, Secretary, Castle-Street, Londonderry.

June 25, 26. — Doncaster Agricultural Society, Doncaster Race Common. Entries close June 7. F. H. Chafer, Secretary, 9, Market-place, Doncaster.

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(1) See also No. 102, *B*. Feb. 1913. (*Ed.*).

July 1-5. — Royal Agricultural Society of England, Bristol. The prizes amount to over £10 000. Special efforts are being made for the success of the "Overseas exhibit." Application for further particulars should be made to Thomas McRow, Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W. C.

July 8-10. — Peterborough Agricultural Society, Peterborough. Entries close June 2. J. E. Little, Secretary, Queen-street, Peterborough.

July 16-18. — Lincolnshire Agricultural Society, Lincoln. Entries close June 7. W. Frankish, Secretary, St. Benedict's Square, Lincoln.

July 23-25. — Yorkshire Agricultural Society, York. Entries close June 7. John Maughan, Secretary, Blake-street, York.

July 31, Aug. 1, 2, 4. — Royal Lancashire Agricultural Society, Burnley. Entries close June 9. E. Bohane, Secretary, Derby House, Preston.

August 26-29. — Royal Dublin Society, Ball's Bridge, Dublin.

Oct. 21-24. — British Dairy Farmers' Association (Dairy Show), Royal Agricultural Hall, London, N. Entries close September 12. F. E. Hardcastle, Secretary, 12, Hannover-square, London, W.

Nov. 1; 3-7. — Brewers' Exhibition, Royal Agricultural Hall, London. Entries close October 14. Jno. G. Hardy, Secretary, 46, Cannon-street, E. C.

Nov. 20-22. — Norfolk and Norwich Christmas Show Association, Norwich. Entries close October 25. Caleb Barker & Co., Secretaries, East Harling, Norfolk.

Nov. 29, Dec. 1-4. — Birmingham Cattle Show, Bingley Hall, Birmingham. Entries close October 20. W. H. Lythall, Secretary, Bingley Hall, Birmingham.

Dec. 8-12. — Smithfield Club, Royal Agricultural Hall, London, N. Entries close October 1. E. J. Powell, Secretary, 12, Hannover-square, London, W.

Dec. 15,16. — Suffolk Fat Cattle Club, Ipswich. Entries close November 12. Robert Bond, Secretary, 6, Butter Market, Ipswich.

United States.

September 17 to October 1. Chicago. — Third International Exhibition of Cold Storage Plant. For particulars apply to 819 Exchange Avenue, Chicago, Illinois.

International Competition for a Beet Lifter and Topper organized by the Great Western Sugar Company, Denver, Colorado, United States. The competition is open until March 1915, but the Company may at any time before such date close the competition and award the prize if a practical machine is presented and if the trials have given satisfaction.

The Association of the German Sugar Industry (Verein der Deutschen Zuckerindustrie) had offered for 1911 and 1912 a prize of 10 000 Marks (about £500) for a lifting and topping machine answering the requirements of the Association; but only a partial prize of 5000 Marks (about £250) has been awarded. A new competition will be held a few years hence after the prizes of the Great Western Sugar Company have been awarded.

342 - Agricultural Congresses.

National Dairy and Cold Storage Congress at Ghent. — This will be held during the 1913 International Exibition. Corresponding Secretary of the Congress: O. André, 59, Rue des Arquebusiers, Bruxelles.

Third International Cold Storage Congress, New York, Washington, Chicago. September 14 to 24, 1913. — Information can be obtained from the Secrétariat de l'Association Internationale du Froid, 9 Avenue Carnot, Paris; the Secretariat of the American Cold Storage Association, 431 South Dearborn Street, Chicago, and from the Secretariat of one of the Associations, or National Committees, affiliated to the Association Internationale du Froid.

Fifth International Congress of Rice-Growing at Valencia, Spain, in 1914.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

343 - Occurrence and Nature of Carbonized Material in Soils.

SCHREINER, O. and BROWN, B. E. — *United States Department of Agriculture, Bureau of Soils, Bulletin* No. 90, pp. 1-28. Washington, December 1912.

An examination was made of that portion of the organic matter in soils which is soluble neither in water, nor in alkali, nor in any other ordinary solvent, and which remains visible to the naked eye as small black particles subsequent to treatment with solvents. Such particles were isolated from the soil mass by a system of hydraulic screening and of sedimentation in liquids of different specific gravities, and finally by a separation under the microscope. On careful examination they could be classed under six headings:

1) Plant material of organic structure.
2) Insect and other material of organic structure.
3) Charcoal particles.
4) Lignite particles.
5) Coal particles.
6) Other material, some of which suggested intermediate stages of formation.

These types of insoluble organic matter were found to exist also in the finer soil fractions, and black particles as a whole were invariably found, not only in a large variety of surface soils examined, but also in subsoils even to a depth of 15 and 50 feet.

The question of the origin of these dark carbonaceous particles is considered. The occurrence of transition stages suggests their formation *in situ* from animal and vegetable remains by a process of slow carbonisation, and of infiltration and deposition of organic matter from soil water. Other agencies which would contribute such material to the soils are suggested: *viz.* forest fires, the erosion of coal seams by water or ice with subsequent deposition, and the disintegration *in situ* of rocks containing veins or seams of such material.

344 - The Influence of a Preceding Crop on Nitrification in Soil.

LITTLETON, L. T. and BIZZELL, J. A. Department of Soil Technology, Cornell University, Ithaca, N. Y. - *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 2, pp. 136-138. Easton, Pa., Feb. 1913.

The study of the principles of crop rotation will necessitate the investigation of the effect of plant growth on the soil. The writers have suggested (*Journal of the Franklin Institute*, Jan. and Feb., 1911, pp. 1-16, 205-220) that certain higher plants have a distinct influence on the process of nitrification in the soil; that this influence varies in intensity with plants of different families, and at different stages of growth. It was found that in a soil on which maize was growing the nitrates were sometimes higher at certain periods than in a similar soil on which no plants grew. *Phleum pratense* maintained uniformly a very low nitrate content in the soil throughout the growing period.

The question then arose whether the higher plants exerted any influence on the activity of the nitrifying bacteria after the plants had been removed. To test this, plots that were used for studying the effect of plants on the nitrate contents of soils in 1910 were kept bare in 1911 until July 1st. To keep down the weeds the plots were disc harrowed. Samples of soil were taken from the sections of the plots that were planted and bare in 1910, and the borings were made to a depth of 8 in. from the surface, and again from 8 to 16 in.

Nitrates in Planted and Unplanted Sections of Plots, Average for the Growing Season, 1910.

Plot Nos.	Crop	Nitrates per million of dry soil	On basis of nitrates in bare soil = 100	Nitrogen in crop, lbs. p. acre
3612, 13, 22, 23.	maize	167	123	3.5
	none	136	100	
3614, 15, 24, 25.	potatoes	104	96	42.7
	none.	108	100	
3616, 17, 26, 27.	oats.	90	71	[illegible]
	none.	126	100	

The small maize crop is partially responsible for the high nitrate content of the maize soil, but this high nitrate content has also been found in maize soil in previous years when the crop was good. Again, nitrates are higher in the potatoes soil than in the oats soil, although the former crop removed 50 per cent. more nitrogen. The nitrate content of a planted soil is not determined by the total quantity of nitrogen removed by the crop, but by a number of factors, of which one appears to be a direct influence which each species of plant exerts on the activity of the nitrifying organisms.

Nitrates in Soil Planted the Previous Year and Soil Unplanted, free from vegetation until July 1st, 1911.

Plot Nos.	Crop	May 1		June 5		June 28	
		First 8 in.	Second 8 in.	First 8 in.	Second 8 in.	First 8 in.	Second 8 in.
3612, 13, 22, 23.	maize	51.5	53.4	77.9	44.6	40.5	34.0
	none	48.1	52.3	68.0	44.0	40.3	30.1
3614, 15, 24, 25.	potatoes	31.3	26.0	49.8	26.4	28.6	23.9
	none.	42.7	43.0	79.7	42.6	35.2	29.4
3616, 17, 26, 27.	oats	22.7	20.7	41.1	33.0	22.1	21.6
	none.	32.3	39.6	68.4	34.8	33.6	31.9

The nitrates on the bare soil are in the same order as on the planted plots; except in the case of maize, they are lower on the planted soil than in the bare plots. The nitrates are highest in the soil previously planted to maize, next in that planted to potatoes, and lowest in that planted to oats.

Ratio of Nitrates in Bare Soil to Nitrates in Soil of Same Plots Previously Planted.

Plot Nos.	Crop	Surface 8 in.			Second 8 in.		
		May 1	June 5	June 28	May 1	June 5	June 28
3612,13,22,23.	maize	108	114	100	102	101	112
3614,15,24,25.	potatoes	73	63	81	60	62	81
3616,17,26,27.	oats	70	60	66	53	95	68

To obtain this statement of the nitrates in the planted sections of the plots in terms of the nitrates in the unplanted sections taken as 100, the nitrates in both planted ends of the four plots planted to the same crop are averaged; the result is divided by the average for the nitrates on the unplanted sections of the corresponding plots. This furnishes the most accurate means of comparison, as it removes more effectively than any other method the local variations in the nitrate content of the soil. There is a distinct and characteristic difference in the nitrate content of the soil previously bearing the different plants. While the experiment covers only one season the differences would seem to be too large and well defined to be accidental.

On July 1st the plots were drilled to millet, the entire plot being planted. The growth of millet was in each plot markedly better on the sections of the plot that had been in crop the previous year than on the unplanted section.

Growth of Millet on the Plots Planted to Different Crops the Previous Year, on the basis of the growth on the oats plots taken as 100, Sept. 8, 1911.

Soil treatment		Plot No.	Growth	Plot No.	Growth	Average growth
Maize	no lime	3612	37	3622	62	49
	lime	3613	47	3623	71	59
Potatoes	no lime	3614	60	3624	81	70
	lime	3615	65	3625	88	76
Oats	no lime	3616	100	3626	100	100
	lime	3617	100	3627	100	100

Comparison of Nitrates in Soil Planted to Certain Crops and the Growth of the Millet on the Same Plots, June 28, 1911.

Crop in 1910	Relative nitrate content	Relative growth of millet
Oats	59	100
Potatoes	67	73
Maize	100	54

Nitrate in Unplanted Sections of Plots Limed and Not Limed.

Plot Nos.	Soil treatment	Nitrates in soil per million			
		May 4	June 5	June 28	Average
3612,22	no lime	40.5	61.2	41.8	47.8
3613,23	lime	54.8	74.0	38.7	56.1
3614,24	no lime	59.0	76.0	34.3	50.3
3615,25	lime	45.4	82.5	36.0	55.0
3616,26	no lime	28.5	51.7	36.2	38.8
3617,27	lime	36.2	85.2	40.3	53.9

It is evident that although the previous crop influences greatly the nitrates content of the soil, the growth of millet is not increased thereby. Nitrates are not the limiting factor in the growth of millet on the experimented soil. Lime increases the growth of millet and also the formation of nitrates, but apparently its beneficial action must be due to some cause other than its influence on nitrate formation.

Concluding, the relation of the nitrate formation to the growth of millet on this soil is a separate problem, probably peculiar to this particular soil. But the interesting condition exists that, of the crops used in the experiments, each had a certain and distinct influence on nitrate formation following the removal of the crops, and on the growth of millet also following their removal; but the effectiveness on the influence is directly opposite. It is not to be expected, however, that this opposite effect would obtain in all soils, since the presence of an abundance of nitrates would under some circumstances throw the influence towards a better growth of the succeeding crop. There is thus presented a problem in crop rotation. If the influence of a certain kind of plant on the formation of nitrates, after its removal, holds for soils other than the one used in the present experiment, this influence may be an important factor in crop rotation. That other, and under some conditions more potent, influences than nitrate formation obtain is also indicated by this experiment.

MANURES AND MANURING

345 – The Changes in Soil Due to Manuring.

1. Maschhaupt, J. G. Onderzoek naar de veranderingen, welke door plantengroei en bemesting in den bouwground teweeggebracht worden, I. Rijkslandbouwproefstation te Groningen. — *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations*, No. XII, pp. 48-71 (66-71) + figs. 8. The Hague, 1912.

2. Hudig, J. Het ontstaan van schadelijke afwirkingen in humusrijke zandgronden, als gevolg van bemesting minerale stoffe. Rijkslandbouwproefstation te Groningen. — *Ibid.*, pp. 83-138 (132-138) + 3 figs.

G. J. Mulder (*Scheikunde der bouwbare aarde*, III, 497-498, 1860) has already drawn attention to the fact that in manuring more care has been paid to the effect on the crop than to the effect on the soil. Recently Sjollema and Hudig (*Verslagen van landb. onderzoekingen der Rijkslandbouwproefstations*, X, 1909) suggest that the so-called "oat disease" recorded on the reclaimed land of the provinces of Groningen and Drent is to be attributed to the injurious influence exercised upon the soil by the vegetation and the manuring.

1. – Taking this and his other previous researches (*Id.*, XI, 1911) as a basis, the writer has undertaken a systematic study of the changes in the soil induced by individual cultivated plants and by the various chemical manures. In the first part of his researches, he studied potatoes, wheat and oats, which he grew in 16 paraffined zinc vessels, each containing 10 kg. (22 lbs.) of light sandy loam. The series consisted of 4 lots treated respectively with 3 gr. of nitrate of soda, 2.5 gr. of sulphate of ammonia, 1.5 gr. of nitrate of ammonia and nothing; three vessels of each lot were respectively planted with the above-named plants and the fourth was not planted. After the first crop was gathered, the soil was sifted, dried in the air and analysed. The second year, the soil was replaced in the vessels and cultivated in the same manner, but the amount of fertilizers given was halved, corresponding to about 450 lbs. of nitrate of soda per acre.

The analysis of the soil was limited to the determination of the rapidity of deposition of the fine clay; 100 gr. of each soil (dried) were taken, put in suspension in a cylinder and repeatedly stirred up; then the volume was made up to 500 cc., the contents of the vessels were again stirred and left for two days to settle; the cylinders were photographed by refracted light. The differences observed after the first year agreed with those of the second, but were less noticeable; the changes taking place after two years of the same treatment are consequently still greater. The results were as follows:

a) The most satisfactory deposition occurred in the non-cultivated soils of the four lots.

b) The deposition was least satisfactory in the cultivated pots of the nitrate of soda lot, intermediate in the nitrate of ammonia lot and that without nitrogen, and much more rapid and complete in the lot with sulphate of ammonia.

c) The effect of the three plants was in the following order: potatoes, wheat, oats.

Taking into consideration the lime content of the aqueous extract of the soil we have:

	mg. lime per 100 cc. 1910	1911
nitrate of soda		
potatoes	8.2	6,7
wheat	10,6	8,7
oats	12,3	8,5
control	13.0	11,8
sulphate of ammonia		
potatoes	13.1	12.4
wheat	13.6	14.4
oats	13.4	13.5
control	14.4	15.7
control		
potatoes	10.1	8.7
wheat	11.0	9.2
oats	12.4	8,9
control	11,0	10.6
nitrate of ammonia		
potatoes	9.6	10.1
wheat	10,9	11.1
oats	12.0	10,8
control	12,5	13.3

The agreement between the lime content of the aqueous extract of the soil and the facts quoted as to the deposition of the fine soil is evident, the latter being taken as the index of the structure of the respective soils. This important agreement is confirmed by the fact that, on equalizing the lime content of the various cylinders by means of the addition of chloride of lime, the differences in the manner of the deposition of the clay disappeared.

For the completion of these researches, the writer proposes to analyse the crops and determine the lixiviation action of the atmospheric precipitations.

2. — The above-mentioned researches of Sjollema and of the writer had indicated as the cause of the "oat disease" the unfavourable effect exercised on humous sands by the long-continued application of lime and manures containing lime, including basic slag, as well as of nitrate of soda. In these researches the writer has studied the alterations which may occur in the soil.

To this end, not having succeeded like the American investigators in separating out definite chemical bodies, he began with ordinary reclaimed soils which had not been limed; from these he separated the organic part *O* and also, by means of solution in soda and fractional precipitation with calcium chloride, two humic substances I and II; these three bodies contained respectively 35.31, 48.29 and 35.65 per cent. of organic matter; and 1.14, 12.77 and 2.56 per cent. of lime. Mixtures of these substances with alluvial sand, *Z*, were placed in 32 pots; the amount of sand was 20 kg. (44 lbs) or 13.4 kg. (29.5 lbs), according to whether only the substances I and II were added or whether O also was added; the amounts of I and II were 100 gr. and 600 gr. or multiples of these, and the amount of O was 3.4 kg. (7.5lbs.) or submultiples of this. In the years 1908, 1909, 1910 and 1911 oats were grown with the application, the first year, of basic slag, sulphate of potash and nitrate of soda and afterwards with monopotassium phosphate in place of the slag; the last year, the ground was specially treated with fertilizers containing manganese and with sulphate and nitrate of ammonia. The following results were observed:

a) II mixed with Z and with Z and O caused the "disease".

b) I caused the "disease" mixed with O only, even in the proportion of ½ per cent.

c) The diminution of the crop due to the "disease" is very evident.

d) Manganese sulphate, manganese hydroxide, and sulphate of ammonia have much curative action.

The soil sickness caused by chemical (alkaline) treatment alone appears to be due to a characteristic belonging to humic substances in general. In fact, besides having been recorded in other soils (sandy, in Holland and Holstein) this phenomenon can be artificially produced. If a mixture of sand and sugar humus is treated with lime or soda and nitrate of soda, this soil after some years becomes sick. The same thing occurs on treating pure sand to which a solution of pyrogallol is added; the latter substance has the property, belonging also to humic substances, of absorbing oxygen from the air in an alkaline medium.

Conclusions:

I. The injurious action of alkaline manuring upon sandy-humous soils, to which is attributed the oat disease, is due to the formation of certain unknown humic bodies, which are chiefly found in those portions of the organic matter which are insoluble in alkalis.

II. Owing to the use of chemical manures, the study of humic substances is especially important. It is therefore much to be wished that abnormal occurrences in the cultivation of humiferous soils should be studied from the chemical point of view. The study of the effects of chemical manures upon humic substances is also of great importance for agricultural bacteriology.

346 - Efficiency of Soluble Manures in Dry Years.

LÉONARDON, F. Efficacité des Engrais solubles en année sèche. Résultats obtenus dans les champs d'Expériences et de Démonstrations en Algérie et Tunisie en 1911-1912. — *Revue Agricole et Viticole de l'Afrique du Nord*, Nos. 49 and 50, pp. 151-155 and 180-186. Algiers, February 15 and 22, 1913.

The experiments with mineral manures were made on the following crops: cereals (wheat, barley and oats), vines, tobacco, cotton, fruit trees and lucerne.

Some experiment fields have not yielded any results owing to the following causes:

a) The crops were not weighed by the experimenters, either through negligence or because the yields seemed too insignificant.

b) The yields were next to nothing owing to late sowing in badly prepared soil, to the unusual drought of the year and to the sirocco of the month of May.

c) Too tardy spreading of the nitrate of soda.

Among the experiments which gave results, the following are the most instructive.

Cereals: Results per acre.

1) *Hard wheat: Loam (Algiers).*

Plot	Manure		Yield per acre	Excess above control	Value at 12s 1d per cwt.			Manure			Net profit		
		lbs.	lbs.	lbs.	£	s	d	£	s	d	£	s	d
1	Control		606	—	—			—			—		
2	Basic slag	446	856	250	1	7	0		11	3		15	8
3	Basic slag . . . . . Nitrate of soda . .	446 89	1100	494	2	13	5	1	0	10	1	12	7
4	Basic slag . . . . . Nitrate of soda . .	446 133	1213	606	3	5	5	1	5	8	1	19	9
5	Basic slag . . . . . Nitrate of soda . .	446 178	1471	805	4	13	4	1	10	6	3	2	10

2) *Hard wheat: Loam (Algiers).*

Plot	Manure		Yield per acre		Excess over control		Net profit		
			grain	straw	grain	straw			
		lbs.	lbs.	lbs.	lbs.	lbs.	£	s	d
1	Superphosphate. . .	267	455	1338	—	—		—	
2	Superphosphate. . . Nitrate of soda. . .	267 89	606	1516	151	178		7	8
3	Superphosphate. . . Nitrate of soda. . .	167 178	735	1605	280	267		13	4

3) *Hard Wheat (Native school at Ben-Chicao).*

Plot	Manure		Yield		Excess over control		Value of excess over control			Manure			Net profit		
			grain	straw	grain	straw									
		lbs.	lbs.	lbs.	lbs.	lbs.	£	s	d	£	s	d	£	s	d
1	Control	—	758	1160	—	—		—			—			—	
2	Basic slag	357	848	1427	89	268		11	7		10	3		1	4
3	Sulphate of potash .	223	803	1338	45	178		6	1	1	2	10		—	
4	Nitrate of soda. . .	223	892	1427	134	268		16	4	1	4	4		—	
5	Slag and nitrate . .	—	1248	1605	900	535	2	16	9	1	14	4	1	2	5
6	Slag and potash. . .	—	1115	1427	357	268	2	0	5	1	13	1		7	4
7	Potash and nitrate .	—	1160	1784	401	625	2	7	10	2	6	10		1	0
8	Slag, potash, nitrate of soda	—	1338	2408	580	1338	3	12	2	2	17	1		15	1

1) *Barley, on calcareous or marly soil (Constantine); rainfall from November to the end of June 142 mm. (about 5½ inches).*

Plot	Manure		Price of manures per cwt.		Yield per acre grain	Excess over control no. 1	Net profit. Barley at 8s 1d per cwt.	
		lbs.	s	d	lbs.	lbs.	s	d
1	Superphosphate . . . . Nitrate of soda	267 27	3 12	7½ 1	1 182	250	6	5
2	Superphosphate	267	—		1 102	170	3	6
3	Control No. 1.		—		942	—	—	
4	Superphosphate . . . . Cyanamide	267 80	11	8	923	0	—	
						over control no. 2		
4[1]	Superphosphate . . . . Cyanamide	267 80	—		825	85	nil	
5	Control No. 2.		—		740	—	—	
6	Superphosphate . . . . Oil cake	267 133	— 7	 3	714	—	—	

Vine: Results per acre.

1) *Carignan vine: flat gravelly soil (Algiers).*

Plot	Manure		Yield	Excess over control	Value at 7s 3d per cwt.			Degrees of the must	Net profit		
		lbs.	lbs.	lbs.	£	s	d		£	s	d
1	Superphosphate.	357	10 955	—		—		11.5°		—	
2	Superphosphate. . . . . Nitrate of soda	357 178	14 078	3 122	10	2	2	—	9	3	7
3	Superphosphate. . . . . Sulphate of potash . .	357 178	12 044	1 142	3	10	7	12.0°	2	13	3
4	Superphosphate. . . . . Sulphate of potash . . Nitrate of soda	357 178 178	14 452	2 560	11	6	10	12.9°	9	10	11

2) *Loam poor in lime (Algiers).*

Plot	Manure	Yield of grapes	Excess over control		Value at 10.81*d* per gal.			Manure and carriage			Net profit		
			grapes	wine									
		lbs.	lbs.	gals.	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
1	Control	17 892	—	—		—			—			—	
2	Organic manure: 892 lbs. per acre, at £5 per ton. .	18 624	731	56.5	2	11	4	2	0	1		11	3
3	Basic slag: 446 lbs. at £2 16s 5*d* per ton. Nitrate of soda: £12 1*s* 11*d* per t.	22 504	4 612	356.4	16	0	11	1	10	5	14	10	5

3) *Carignan, Morastel and Alicante vines: loam on clay subsoil (Medeah).*

Plot	Manure		Yield of grapes	Degree of must	Excess over control		Value at 1*s* 1.8*d* per gallon			Manure			Net profit		
					grapes	wine									
		lbs.	lbs.		lbs.	gals.	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
1	Control	—	8 654	14°	—	—		—			—			—	
2	Basic slag . . . . Sulphate of potash	357 134	9 992	—	1 338	986	5	18	1	1	3	9	4	14	4
3	Sulphate of potash Nitrate of soda. .	134 134	10 706	—	2 052	1 650	9	10	0	1	7	11	8	2	1
4	Basic slag . . . . Nitrate of soda. .	357 134	10 884	—	2 230	1 784	10	5	4	1	4	8	9	0	8
5	Basic slag . . . . Potash . . . . . Nitrate of soda. .	357 134 134	11 598	14.5°	2 944	2 319	13	7	0	1	18	2	11	8	10

4) *Carignan vine, loam, poor in phosphoric acid and in calcareous compounds, irrigated (Philippeville).*

Plot	Manure per acre	Yield of grapes	Excess over control		Value at 1s 0.1d per gallon			Manure at 12s 1d per cwt.			Net profit		
			grapes	wine									
		lbs.	lbs.	gals.	£	s	d	£	s	d	£	s	d
1	Control.	9 403	—	—	—			—			—		
2	254 lbs. nitrate of soda . .	11 116	1 713	138	6	19	3	1	7	6	5	11	9
3	379 lbs. nitrate	10 295	892	71	3	11	10	2	0	11	1	10	11

Forage Plants: Results per acre.

Five-years-old lucerne; loams, insufficient irrigation (Algiers).

Plot	Manure per acre	Dry hay (total of 5 cuts)	Excess over control	Value of excess at 4s per cwt			Net profit		
		lbs.	lbs.	£	s	d	£	s	d
1	Control	8 341	—	—			—		
2	1070 lbs. superphosphate . .	10 036	1 695	3	1	0	1	14	0
3	1070 lbs. basic slag	10 616	2 275	4	1	10	2	14	10

From the above experiments the following conclusions may be drawn:

I. — Mineral manures are more efficient than organic manures. Among the nitrogenous manures used (organic manures, oil-cakes, cyanamide, nitrate of soda) nitrate of soda yielded the best results. In most cases the other nitrogenous manures did not give any excess over the control plot.

II. — The manures must be ploughed in early, excepting the nitrate of soda which should be given as a top-dressing: in February in the vineyards, in December one-third and in February or March two-thirds on cereals. For other crops the nitrate of soda is to be ploughed in with the phosphatic and potash manures.

III. — There is a minimum of moisture below which manures act but little, and give no profits. According to M. Chouchak, in Crimea if the rainfall is less than 200 mm. (8 inches) from November to the end of June and on soils containing less than 15 per cent. of moisture, manures increase the yield by very little or nothing.

IV. — Phosphatic manures are insufficient in poor soils or in those only moderately rich in nitrogen. They must be completed by nitrate of soda or by sulphate of potash.

347 — Fertilizers and Manures in Canada.

(1) EMSLIE, L. E. The Use of Commercial Fertilizers in Canada. *Communicated by* T. K. DOHERTY, *Commissioner of the International Institute of Agriculture in Canada.* (2) NUNNICK, F. C. Agricultural Survey, 1911. — *Commission of Conservation, Canada, Report of the Third Annual Meeting, held at Ottawa, January 6th 1912*, pp. 106-120 + tables. Montreal.

(1) *The use of fertilizers in Canada.* — The use of commercial fertilizers in Canada has scarcely passed the initial stage, although in the Maritime Provinces, more especially in the fruit and potato-growing districts, fertilizers have been popular for years. Ontario and Quebec have, during the past five years, been giving the subject more attention and may be expected to rapidly increase their consumption from this stage. British Columbia quickly learned the value of fertilizers and takes high rank as a consumer. This year a Victoria firm shipped a carload of fertilizer to Dawson City in the Yukon. The Provinces of the middle-west will not be heavy consumers for many years to come, although the use of fertilizers there has commenced, chiefly amongst market-gardeners and potato-growers, but they are also being used to a small extent by grain-growers. The prevailing high freight rates necessarily add greatly to the cost of the fertilizer, and this aggravates the difficulties of pioneer work. In the younger provinces of Alberta and Saskatchewan, the interest in the fertilizer question seems greater than in Manitoba. This may be explained by the fact that within recent years there has been a very large emigration of United States and European farmers to Alberta and Saskatchewan, men who were already familiar with the use of fertilizers.

The following table shows the principal fertilizer materials imported into Canada during the years ending June 30th, 1904, and February 29th, 1912, respectively, and a comparison of the two years indicates the increase which has taken place in the intervening period :

	12 Months ending June 30th, 1904		12 Months ending Feb. 29th, 1912	
	lbs.	$	lbs.	$
Fertilizers (manufactured)	—	134 063	—	413 005
» (unmanufactured) . . .	—	19 155	—	3 151
Muriate and sulphate of potash .	1 836 315	33 740	6 840 138	125 819
Kainit and other potash salts . .	726 917	5 868	985 750	9 252
Acid phosphate	285 707	15 248	1 348 122	61 554
Phosphate rock	—	8 000	—	43 771
Blast furnace slag	—	6 808	—	119 141
Sulphate of ammonia	186 084	5 485	520 863	16 156
Nitrate of soda	12 849 769	258 578	58 711 867	873 766
Nitrate of potash	1 978 972	86 308	2 273 437	107 313

In the case of " Manufactured Fertilizers " and a few other items it has been impossible to get the quantities, the value only being given. "Unmanufactured " fertilizers represent those materials which could not be properly identified, and the decrease in the amount of these will

a). — *Area Surveyed.*

	Nova Scotia	Prince Edward Island	New Bruns-wick	Quebec	Ontario	Mani-toba	Saskat-chewan	Alberta	British Colum-bia
No. of farms . . .	100	100	100	200	300	100	87	85	140
Total acreage . . .	16 803	10 002	13 091	30 552	33 340	39 000	35 303	22 713	62 428
Field crop acreage .	5 958	8 220	6 830	10 450	24 644	28 045	24 616	16 222	14 761
Percentage of total area	35	74	49	34	74	70	70	71	24
Grain acreage . . .	1 072	2 508	1 750	5 040	10 917	26 003	24 140	12 855	13 052
Percentage of field crop area	18	30	25	34	44	93	98	78	25
Hoe crop acreage. .	277	510	210	800	3 126	205	—	89	1 203
Percentage of field crop area	5	6	3	4	12	0.62	less than ½	0.54	9
Hay and pasture acreage	4 600	5 100	1 837	11 014	10 500	1 757	—	—	9 840
Percentage of field crop area	77	62	21	66	43	6	1.8	21	67

b) *Use of Farm Manures.*

(Figures as percentages).

	Nova Scotia	Prince Edward Island	New Bruns-wick	Quebec	Ontario	Mani-toba	Saskat-chewan	Alberta	British Colum-bia
No. using farm manures	100	100	100	100	100	most farmers	78 % use some	70	88
No. giving no care to manure . . .	22	64	44	76	44	77	the majority	—	55
Very little care. .	11	—	15	—	3	—	—	—	—
Fair care	59	33	40	20	25	14	10	5	18
Good care	8	—	—	4	15	—	11	—	—
No. burning the straw	—	—	—	—	—	10 4 % burn some	—	—	—
No. burning the manure	—	—	—	—	—	—	22	many	—

indicate better classification facilities in recent years. "Acid Phosphate" (non-medicinal) would seem to include a large proportion not used for fertilizer purposes, since the value given is much in excess of the price of this material as a fertilizer. "Nitrate of Soda" is at present the most popular form of nitrogenous fertilizer, but the bulk of this material imported is used for manufacturing purposes, and it is yet impossible to estimate even approximately the amount used for fertilizer purposes. "Nitrate of Potash" is also almost entirely used for industrial purposes, its use as a fertilizer being very limited.

No figures are available to show the production of fertilizers in Canada itself, but most of the slaughter-house tankage and bones, formerly exported, is now, by the addition of potash, being converted into mixed fertilizer for home consumption.

The importation of other fertilizer materials gives, however, a sufficient indication of Canada's increasing fertilizer consumption.

(2) *The use of farmyard manure in Canada.* — From the summary of the agricultural conditions found by the Commission of Conservation of Canada in the localities where the agricultural survey was conducted in 1911 the data on the use of [farmyard manure given on the previons page are extracted.

348 - A Potash Salts Deposit in the United States of America.

DOLBEAR, C. E. The Searles Lake Potash Deposit. — *The Engineering and Mining Journal*, Vol. 95, No. 5, pp. 259-261 + fig. New York, February 1913.

Many potash salts deposits have been alleged of late in the United States, but apparently the best prospects are in the Searles Lake. This is a floor of an ancient lake which lies between the State and Argus Ranges just south of the boundary line between Inyo and San Bernardino Counties in California. The deposit is on and under the bottom of the lake, the area of which is about 40 000 acres. Potassium was not looked for at first, but sodium carbonate in such condition that it could be readily reduced to soda ash.

Borings were made over the salt-bed area at intervals of from one-half mile to one mile and determined the following facts: that the average thickness of the soluble-salt bed is a little over 70 ft.; that the first 23 ft. is mostly sodium chloride with a greater or less amount of impurity in the form of sodium sulphate and small amounts of sodium carbonate and borax; that the underlying 47 ft. is composed of strata of mixed sodium chloride, sulphate, carbonate, bicarbonate and borax, together with potassium chloride. All of the deposit is coarsely crystalline in structure, much honeycombed, and the interstices are filled with a brine saturated with all of the salts of the deposit except sodium bicarbonate.

This brine has a specific gravity of 1.3. The analyses of the brine show remarkable regularity of content throughout the whole of the underlying beds; that is below the first 23 ft., 100 lbs. of this brine carries, on the average, dissolved salts in the following amounts :

	lbs.
sodium chloride	16.77
" sulphate	5.46
" carbonate	4.01
" biborate (anhydrous)	1.32
potassium chloride	4.49
Total	32.05

The salt obtained by evaporating to dryness and calcining the product to expel combined water, analyses :

	per cent.
sodium chloride	51.3
" sulphate	16.7
" carbonate	14.1
" biborate	4.0
potassium chloride	13.8

The brine constitutes approximately 18 % of the total weight of the mass of the deposit. The brine carrying the more valuable salts occurs below the sodium-chloride bed. The underlying bed averaging approximately 47 ft. thick, and the area explored being 12 sq. miles, the total weight of the underlying bed is then approximately 800 000 000 tons, and 18 % of this is 144 000 000 tons. As the brine carries an average of 4.49 % potassium chloride, the tonnage of that salt in solution is then 6 465 600 tons. The brine also carries 1 900 000 tons of anhydrous borax, equivalent to 3 400 000 tons of commercial borax ; further the brine carries 6 630 000 tons of sodium carbonate.

The solids of the deposit below the sodium-chloride bed have the following average analysis :

	per cent.
insoluble (sand, etc.)	1.41
sodium chloride	15.90
" sulphate (anhydrous)	42.80
" carbonate (ditto)	16.57
" bicarbonate	6.50
" biborate (anhydrous)	2.32
potassium chloride	3.64

The total amounts of the valuable salts in solid form are then :

	tons
sodium carbonate	108 500 000
" bicarbonate	42 700 000
" biborate (anhydrous)*	15 200 000
potassium chloride	23 900 000

(*) equivalent to 27 300 000 tons of commercial borax.

That the brine is free to flow through the solids is shown by boring a well into the material. A 6-in. hole bored through the deposit and cased through the sodium - chloride bed will yield not less than 3000 tons of brine per day.

At present the evaporation-power of the air in July and August is about 1 in. per day of saturated brine ; the actual evaporation is probably much less, as the surface is only kept damp by capillary action. In any case, the pumping of the brine would check this movement, and any water flowing into the bed would dissolve out more of the salts and so keep up the supply of brine.

The brine alone is alleged to contain sufficient potassium chloride to supply the United States with that salt at the present rate of consumption for 16 years, supposing there to be no renewal of the brine. With a renewal as above suggested the deposit is stated capable of supplying potassium chloride at the present rate of consumption for at least 70 years.

349 – The Use of the Phonolite of the Bohemian Mittel Gebirge as a Fertilizer.

SEEMANN, F. Ueber die Verwendung der Phonolite des böhmischen Mittelgebirges zu Düngerzwecken. — *Landwirtschaftliche Jahrbücher*, Vol. XIII, Part 4, pp. 509-520. Berlin, 1913.

Since 1908, the West German Railway Co. (West deutschen Eisenbahn-gesellschaft) and, more recently, the Rhenish Potassium Silicate Works (Rheinischer Kalisilikatwerken) the Kempenich Phonolite Works of the Graf Gleichen Mining Co. (Kempenicher Phonolitwerken der Gewerkschaft Graf Gleichen), and the Leuchtenberg Mining Co. (Gewerkschaft Leuchtenberg) have put on the market under the names of " phonolite meal ", " silicate of potash ", " eifelite " and " vulcophonolite " a potash manure made from crushed rocks from the Eifel. It appears that, in spite of the negative results obtained in many Agricultural Stations and Institutes, the use of this new fertilizer is increasing. Thus, phonolite from the Bohemian Mittelgebirge is also placed on the market.

The writer, basing his opinion on already existing analytical and mineralogical data, comes to the conclusion that the phonolite of the Mittelgebirge of Bohemia is, from its chemical and mineralogical composition, much less suitable as a fertilizer than the leucitophyre of the Eifel. For while the potassic constituent of the latter is leucite, which is very soluble and particularly rich in potash, that of the former is sanidine, a comparatively insoluble substance much poorer in potash. Leucitophyre possesses a total potash content of 9 or 10 per cent., and a soluble potash content of about 3.5 per cent., while the total amount of potash usually present in the Bohemian phonolite is usually only 4 to 6 per cent., rarely amounting to 7 per cent., and that of soluble potash never exceeds 2 per cent. and is as a rule only 1 per cent. The addition of calcareous salts or humiferons matter to increase the solubility of the potash is less satisfactory in the case of the phonolite than in that of the leucitophyre.

The writer, in conclusion, warns his readers that more care is required in obtaining and applying phonolite meal than is needed in the case of Eifel leucitophyre meal.

The deposits in question are those of natrolitic phonolite of Marienberg and Steinberg near Aussig, and the tephritic phonolite of Ziegenberg near Gross-priesen.

350 - Catalylic Radio-active Manures

MALPEAUX, L. Les engrais radioactifs. — *La Vie Agricole et Rurale*, Year II, No. 9, pp. 242-243. Paris, February 1913.

Manurial trials to test the efficiency of catalytic radio-active (1) manures were carried out at the Agricultural School of the Pas de Calais. Some preliminary pot experiments with oats and crimson clover (*Trifolium incarnatum*) gave positive beneficial results whenever the radio-active manure was employed. In the field trials the radio-active manure was mixed with other common fertilizers, forming 5 per cent. of the bulk, and the application per acre varied from 22 to 44 lbs.

Some of the results obtained were as follows:

	With radio-active manure	Without radio-active manure
Oats	87 bushels p. acre	76 bushels p. acre
Mangels . . .	22.2 tons „ „	21.5 tons „ „
Sugar beets. .	8.8 „ „ „	7.7 „ „ „

In the case given above the oat crop was increased 15 per cent., but on neighbouring plots, where the dressing of super was replaced by slag, the increase was nil. The mangels and sugar beets both gave increased yields, and on analysis no difference in composition could be detected between those grown on the check plots and those grown on the plots receiving the radio-active manure, but the sugar beets on the latter plots matured earlier.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

351 - The Intensity of Light and its Effects on Vegetable Assimilation.

MÜNTZ, M. A. La luminosité et l'assimilation végétale. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 5, pp. 368-370. Paris, February 1913.

In laboratory experiments on carbon assimilation it has been demonstrated that assimilation is more active in direct sunshine than in diffuse daylight, and, by analogy, it has been assumed that the same held good for vegetation under natural conditions. Of course under field conditions, the plants exposed to diffused daylight are also exposed to far more humid conditions generally, and the larger supply of water more than counteracts the effect of the greater light intensity. But given that the water supply was always sufficient, what is the effect on vegetation of light of high intensity? In order to test this point a crop of lucerne was set aside at Meudon during the three summers 1910, 1911 and 1912. Part of it was given no special treatment, while the other received 40 litres of water per square metre every 7 days, so that the soil never dried out. The yields of dry matter per square metre per day were as follows :

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(1) See No. 781, *B.* May 1912. (*Ed.*).

	Under natural conditions	Watered
1910	5.24 grams	10.56 grams
1911	1.24 »	7.00 »
1912	3.12 »	9.42 »

During the years 1910 and 1912 the sky was overcast during the greater part of the summer, whilst 1911 was a season of bright sunshine and drought. The yields under natural conditions show the relative importance of light intensity and water supply in plant growth, but even when the latter factor is eliminated by artificial watering, the more intense light appears to have an unfavourable effect on the production of vegetable matter.

This apparently contradictory result obtained when a laboratory experiment is extended to field conditions arises from the fact that in the laboratory the plants are necessarily kept in an artificial atmosphere relatively richer in carbon dioxide in order that it should be possible to detect variations in the percentage of that gas caused by the process of carbon fixation ; whilst in the natural atmosphere the amount of carbon dioxide present is so small that the solar radiations, be they diffused or direct, are always sufficient to make the best use of the carbon dioxide. In other words, carbon assimilation is limited by the amount of carbon dioxide in the air and not by the intensity of the solar rays.

352 - The Effect of Weak Acids on Germination.

PROMSY, G. Role des acides dans la germination (a note presented by M. Gaston Bonnier). — *Bulletin des Séances de la Société Nationale d'Agriculture*, Year 1912, No. 10, pp. 916-922. Paris, 1912.

Citric, malic, tartaric, acetic, hydrochloric and sulphuric acids were employed, in solutions varying from 0.05 to 0.5 %, and seeds with both succulent and dry pericarps. Seeds with succulent pericarps, such as tomatoes, would under natural circumstances germinate in an acid medium, and these all profited to the largest extent by the external application of acid during germination. Seeds of non-acidic fruits were sometimes assisted and sometimes hindered in germination by an acidic medium, the effect being apparently due to the action, favourable or otherwise, of the acid on the diastatic activity of the seed.

The favourable action of the acid was obtained not only by germinating the seed in an acidic medium, but also by a preliminary soaking of the seed in acid and subsequent sowing in a neutral medium ; the small quantity of acid absorbed during the steeping was sufficient to modify the vegetative growth in a remarkable manner. If the seed was subsequently sown in an alkaline medium, the beneficial effect of the acid was diminished, but still perceptible; certain nutritive materials also had a neutralizing effect.

The absorption of acid was greatest during the first stages of germination, varied directly with the concentration of the solution, and was apparently independent of the action of light. The absorbed acid must have been rapidly transformed after absorption, as the internal acidity of the seedlings was not increased, a further proof of its rapid decomposition being indicated by an increased respiration of the seedlings. While light did not appear essential to the decomposition of the acid, it produced a favourable influence on its assimilation and utilization.

The absorbed acids not only modified the metabolism of the seedlings, but also their morphology; on the one hand they retarded the sclerification of the fibrous tissue and the lignification of the wood, and on the other hand increased the volume of the central cylinder and the growth of the conductive tissue.

PLANT BREEDING

353 - The Selection of Hungarian Wheat.

GRABNER, ÉMILE (Director of the Royal Hungarian Station for Plant Breeding at Magyaróvár). A magyar buza nemesitése. — *Köztelek*, Year 23, Nos. 11 and 15, pp. 330-333 and 407-408. Budapest, February 8 and 15, 1913.

The question of the systematic improvement of Hungarian wheat has for some years become of increasing importance, for though the native cereal is suitable to the climate, as it ripens early and resists the winter cold, it does not supply the needs of the country, for its yield is poor and it not only lodges much, but is greatly predisposed to the attacks of rust.

Numerous and repeated experiments made with the acclimatized varieties, Hybrid Treasure and Prolific, have shown that these cannot withstand very severe cold; thus, in spite of their superior quality, they are useless as substitutes for Hungarian wheat. Now, if by means of rigorous selection the average wheat yield throughout Hungary could be increased by 2 or 3 bushels per acre (at present, it does not exceed 15 ½ to 17 bushels per acre) the 9 162 150 acres under wheat would give an extra yield of 18 to 27 million bushels, representing an increase in the revenue of the country of £4 000 000 to £6 000 000, reckoning the price at only 36*s* 6*d* per quarter.

In 1905, the Royal Hungarian Institute for Plant Selection at Magyaróvár began its first selection experiments in the different districts of the country, and then persuaded the owners of three large estates, Arpádhalom, Bankut and Csorvás to carry out experiments on larger areas. As Hungarian wheat, like other unimproved varieties, is not uniform, but is a mixture of more or less different types, it was necessary to adopt pedigree breeding. The task consisted, on the one hand of selecting plants with different characteristics from the experiment fields, and on the other of only reproducing selected types superior to the parent variety. The choice of select types was made with a view to securing early maturing varieties with a heavy yield of grain, strong-strawed and resistant to frost. The

355 - A Variety of Maize with Silks maturing before the Tassels.

COLLINS, G. N. — *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 107, pp. 1-11. Washington, February 1912.

In the varieties of maize cultivated in the United States the anthers usually open before the silks (stigmas) appear on the same plant, and pollen is still falling when the silks are in a receptive condition. Except where high and constant winds prevail at flowering time, this results in a large proportion of self-pollinated seed. In maize, self-pollination so reduces the vigour of the plants that any means by which it can be avoided or reduced is worthy of consideration, and the best means of so doing is to produce a protogynous plant, as in that case, should cross-pollination fail, there is still the chance of self-fertilization.

Many attempts have been made to develop this habit in some of the improved varieties, but so far without success. In January 1912, two ears of red pop corn were purchased at Granada, Spain, by a member of the Staff of the Bureau of Plant Industry and when planted in Maryland the following season produced plants almost every one of which was protogynous. The ears of this variety are so small that it will probably be of no economic importance, except perhaps as a pop corn, and moreover, the subsequent behaviour of a variety cannot be inferred by its behaviour the first year; but it seems certain that the protogynous tendency exists in a marked degree, and the strain may prove valuable as breeding material. Only a small quantity of seed is on hand, but a few grains can be supplied to those wishing to make a study of this variation and to assist in determining its economic importance.

CEREAL AND PULSE CROPS

356 - Investigation of the Relation between Anatomical Structure and Physiological Characters in Oats.

JAHUSHKINE, O. W. and VAVILOV, N. Anatomilchaskoe izsledowanie nieskolkich rajs ovsa v sviaji s voprosoni o sotnoschenii phisiologuitcheskich svolstv s anatomicheskinii koeffizientami — *Jurnal Opeinoi Agronomii* (Russisches Journal für Experimentelle Landwirtschaft), Year XII, Part 6, pp. 830-861 (855-861). St. Petersburg, 1912.

Of late years, the question of the importance of the size of leaf cells and particularly the size of stomata in distinguishing the different varieties of cereals and other cultivated plants has been much brought forward by the works of Prof. V. Kolkunov of Kiev. (1). According to the latter, there is an intimate connection between the anatomical structure of plants (the size of the stomata) and the intensity of different physiological functions, such as the assimilation of carbonic acid, transpiration energy, osmotic pressure of the cell sap, and indirectly in the case of cereals, the duration of the vegetative period. In other words: Prof. Kolkunov shows by his experiments that the degree of drought resistance, early or late maturity, winter resistance, etc., depends upon the anatomical peculiarities of the plant and especially on the size of its stomata.

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(1) See No. 1621, *B.* Dec. 1912.

The article in question gives an anatomical examination of some cultivated varieties of oats which show various morphological and physiological characters in order to throw light on the magnitude of the differences which exist in oats in this respect. It was also interesting to compare the several anatomical differences with the physiological characteristics of the different varieties, especially as oats were hardly touched on in Prof. Kolkunov's investigations.

As material for this purpose pure lines of oats were taken, these being obtained by individual selection from various mixed German and West Russian varieties. The lines chosen for the experiment were sown in the spring of 1911 and 1913 in plots on a levelled price of land belonging to the Moscow Agricultural Institute, each plant being given 14 sq. in. standing room.

The leaves for measuring were gathered from definite nodes of the main culms from the middle of the plots as soon as the leaves ceased growing. The portions of the leaves at two-thirds of the length (measuring from the base) were selected for measurement. The stomata on the upper surface near the midrib were measured. To obtain the average size of the openings of the stomata, not less than 1 000 measurements (on 50 leaves) were taken for each variety. In addition to the length of the stomata, their number in the field of the microscope was also reckoned. (Eyepiece 4, Objective 4, Reichart System).

All the 17 varieties of oats investigated belonged to the group with covered grains and with the branches of the panicle spreading in all directions : ***Avena sativa* L.**

As there is no uniform system for the classification of cultivated oats, the writer gives a short morphological description of the varieties he investigated.

In the large table the results of the investigations of 1911 and 1912 are given. From the first column of this it is seen, as would *a priori* have been supposed, that the size of the stomata can in the case of oats, as in that of other cereals, be taken as a variety characteristic.

In the present case, where 17 varieties of oats were dealt with, two groups can be distinguished by the size of the stomata :

I. Large-celled group :
A-1113 Meshugo, A-321 Hudan, C-311 Brie
Average length of aperture :
for the top leaf, 1911 0,063 mm.
» » third 1912 0,0735 »
II. Small-celled group : the other 14 varieties.
Average length of aperture :
for the top leaf, 1911 0,054 mm.
» » » 1912 0,067 »

The inheritance of differences in the size of the stomata is proved by the fact that variations occurred in the same direction for two consecutive years in both the experimental and the control plots.

TABLE I. — *Results of the Investigation*

Variety	Leaves of 1st node (reckoning from above) in 1911			Leaves of 2nd node (from above) in 1911			Leaves of 3rd node (from above) in 1911		
	Length of apertures of stomata μ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of apertures of stomata μ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of apertures of stomata μ	Number of stomata in field of microscope	Area of leaf sq. cm.
C-311: Brie, from Vilmorin, 1904 (1)	62.7	65					68.0	40	5.9
	64.7	60	8.0	—	—	—			
A-315: Canadian » » . .	56.1	56							
	55.7	55	7.8	—	—	—	64.0	34	7.0
A-317: Australian » » . .	54.5	61	14.1	53.1	60	—	66.0	32	10.5
A-321: Hudan » » . .	63.4	55							
	58.9	62	8.5	—	—	—	69.1	38	5.2
A-324: Probsteier » » . .	54.4	65		60.0	49				
	52.6	70	11.5	59.6	49	15.7	66.2	35	6.2
B-326: Swedish » » . .	53.5	64							
	54.5	64	11.7	—	—	—	64.8	33	6.1
A-351: Duppauer, from Breslau Exp. Field, 1901	52.4	71							
	51.8	70	10.6	—	—	—	65.0	36	4.7
A-359: Leutewitzer, from Breslau Exp. Field, 1901	55.6	65							
	53.9	64	10.5	56.5	56	—	65.8	35	7.7
A-368: Heine's Ertragreichster, from Breslau Exp. Field, 1902	55.5	62							
	53.5	67	11.8	57.0	51	19.4	66.2	32	7.4
A-393: Danish, from Exp. Sta. at Hoinow (Polotsk) 1902	54.5	61							
	53.5	66	11.8	—	—	—	—		—
A-396: Heine's Ertragreichster, from Exp. Sta. at Hoinow (Polotsk), 1902	56.1	57							
	54.9	63	11.6	57.3	53	—		—	—
B-4000: Duppauer, from Exp. Sta. at Hoinow (Polotsk), 1902	50.3	66							
	53.6	61	9.7	—	—	—	62.5	36	8.9
A-4020: Newmarket, from Exp. Farm of Wissokolitovskoy (Grodno), 1903	56.4	60		59.8	50				
	55.3	64	9.8	58.0	50	15.1	64.0	36	8.9
A-4035: Ligovo, from Livland, 1903	54.9	67		58.0	50				
	54.8	66	9.8	57.7	54	18.2	—	—	—
A-4051: Swedish selected.	56.9	59							
	555	61	9.5	—	—	—	—	—	—
A-4071: from Kirsch (Germany), 1906	55.2	53							
	54.7	55	12.2	58.5	47	17.9	61.1	36	5.6
A-4113: Mesdago from Haagen Schmidt, 1908	64.1	57	12.4	62.0	50				
	—			65.0	50	—	73.5	31	10.3

(1) Two sets of figures for one variety refer to two different plots.

of Varieties of Oats (1911 *and* 1912).

Vegetation-period in days			Tillering		Total yield (grain and straw) per plant			Yield of grain per plant			1000 grain weight	Attack of rust (*Puccinia coronifera* Kleb.)
1911	1912	Average	1911	Average 1911	1911	Average 1911	1912	1911	Average 1911	1912	1911	
Days					gr.			gr.			gr.	
122	118	120	2.8	2.9	6.8	8.2	6.6	2.7	3.0	1.9	28.0	moderate
			3.0		9.7		8.4	3.4		2.6		
			1 6		6.4			2.8				
108	105	107	1.5	1.6	5.8	6.1	7.3	2.8	2.8	3.4	38.5	severe
			1.9		5.8			2.8				
102	97	100	2.1	2.0	6.6	6.2	5.8	3.2	3.0	2.1	35.4	»
			3.4		7.5			3.0				
122	119	121	3.1	3.3	7.2	7.4	—	2.8	2.9	—	26.6	moderate
			2.3		7.4		9.7	3.8		3.0		
108	107	108	2.0	2.2	6.0	6.7	9.2	2.9	3.4	3.2	35.9	severe
			2.0		5.4			2.5				
109	105	107	1.7	1.9	6.6	6.0	5.4	3.1	2.8	2.2	37.8	»
			1.9		7.5			3.6				
109	105	107	1.8	1.9	6.5	7.0	5.9	2.7	3.2	2.5	33.5	»
			1.9		7.9			3.4				
108	107	108	1.6	1.8	6.5	7.2	6.9	2.9	3.2	2.6	37.2	»
			1.5		7.2		7.2	3.2		2.6		
109	107	108	2.0	1.8	7.9	7.6	7.8	3.6	3.4	3.0	33.8	»
			1.7		5.8			2.3				
108	112	110	2.1	1.9	4.2	5.0	3.8	1.7	2.0	1.7	36.0	»
			1.4		7.0			3.1				
108	105	107	1.4	1.4	6.0	6.5	—	3.0	3.1	—	33.9	»
			1.6		6.0			2.9				
110	105	108	1.8	1.7	6.6	6.3	3.8	3.2	3.1	1.7	37.2	»
			1.9		5.6			2.6		2.8		
110	105	108	1.9	1.9	6.7	6.2	8.5	3.1	2.9	3.0	40.3	»
			1.9		5.5			2.8				
112	105	109	2.0	2.0	6.9	6.2	5.2	3.0	2.9	2.1	38.5	»
			2.2		7.3			3.0				
114	107	111	2.6	2.4	7.8	7.6	3.1	3.6	3.3	1.5	40.2	»
			2.0		7.0			2.9				
114	112	113	2.0	2.0	7.8	7.7	4.6	3.4	3.2	1.7	39.7	»
			2.6		6.7		5.6	2.9		1.8		
98	94	96	2.4	2.5	6.2	6.5	5.2	2.8	2.9	1.6	30.8	»

According to the investigations of W. Zalensky and W. Kolkunov, as well as to the present observations on oats, there is a certain correlation between the size of the guard-cells and that of the aperture. As regards the number of the stomata, this is, according to Prof. Kolkunov, "a function of the length of the stomata," but this parallelism did not come out in the investigations of the writers on oats here desribed. Thus, the large-celled lines C—311 and C—321 in 1911 has a relatively large number of stomata (38 and 40 in leaves of the third node from below), while A—4113 in the same year had a smaller number (31) in the corresponding row of leaves. Further, there is no rule in the case of the second group of oats (those with small stomata).

The oats investigated show no correlation between the linear size of the stomata and the leaf area. Thus the large-celled C—311 and C—321 have the narrowest leaves, while the equally large-celled A—4113 has quite large leaves, well-developed as regards length and width. On the other hand, the Australian oat, A—317, a typical representative of the second small-celled group, shows a luxuriant leaf development. This has the largest leaf area.

With regard to the anatomical characteristics of the oats, it was found that the results confirmed W. Zalensky's law respecting the division of the stomata according to number and length in the different rows, viz. "the higher the insertion of the leaf, or the further the latter is situated from the root system, the more stomata it has on the same area in comparison to those of a leaf which is placed lower down; but on the other hand, the size of the stomata diminishes with the distance from the root-system."

As in wheat, so in oats, the number of stomata on the upper surface of the leaf is larger than that on the lower; this is contrary to the general opinion on the subject. In distinction to what Prof. Kolkunov found in wheat, the stomata on the lower surfaces of the oats examined by the writers were invariably the larger.

As to the regularity with which the stomata are distributed on the leaf surface, it has also been observed that the number of openings increases in the direction of the tip of the leaf, but their length decreases.

The observations of Prof. Kolkunov, who succeeded in establishing a number of correlations between the anatomical and physiological characters of some varieties of maize and wheat, were not confirmed by the writers' experiments on varieties of oats. For these investigations they selected those properties, which are most important for summer cereals in a fairly damp climate with a moderate summer temperature, *i. e.* the length of the vegetative period, the degree of rust resistance, etc.

From these observations, there appears to be no connection between the length of the stomata and the length of the vegetative period. Mesdago, which generally ripens early, and Brie and Hudan, which are the latest, have stomata of the same size.

In the same manner, no regular correlation exists between the size of the cells and the amount of tillering. Three large-celled lines, C—311, A—321 and A—4113 tiller freely (3.3, 2.9, 2.5) but A—4051, a smaller-called variety, resembles them in this respect (2.4); whilst A—396, which tillers least (1.4), does not possess cells of the smallest size.

Eriksson and Marshall Ward only arrived at negative results respecting the connection between size of stomata and susceptibility to rust. According to the investigations of the writers, Lines C—311 and A—321, which have the biggest stomata which are also fairly numerous, are least susceptible to rust (*Puccinia coronifera* Kleb); this agrees with the results of Marshall Ward's researches, that "Susceptibility to or immunity from fungus attack does not depend upon the anatomical structure of the leaf, but upon one or more internal factors."

Finally, as might *a priori* have been expected, yield, as a function of many factors, does not depend upon a single cause, and is therefore not entirely dependent upon the size and number of the stomata.

These negative results are neither improbable not unexpected. For, "in truth the structure of plant organs tells us very little concerning their functions," as Johannsen writes in his *Elementen der exakten Erblichkeitslehre*. "The same structure in organisms permits of differences of function and thus it is clear that similarity of function cannot be uniformly assumed from similarity of form" (Pfeffers' *Pflanzenphysiologie*, p. 291).

The present subject leads also to the question of the correlation between various physiological functions and anatomical structure, and the possibility of determining the former from the study of the latter. "All such methods are based on the principle of correlative variability and have doubtless been of good service in facilitating quick classification, and easy valuation, but they have also led to grave error of judgment." Johannsen, *Elemente* chapter XVIII.

The doctrine of correlation has itself undergone great changes in the course of the last few years; these are especially due to the influence of Mendelism, which insists upon the independence and integrity of characters.

It should also be mentioned that in addition to these 17 varieties of oats, 10 others were investigated, but are not described here. The results of these researches are on the whole in agreement with those described above.

357 - Wheat Investigations in India.

HOWARD, A. — *Report of the Agricultural Research Institute and College, Pusa, for 1911-12*, pp. 31-43. Calcutta, 1913.

One of the first results of the wheat investigations at Pusa was the demonstration that varieties of high milling quality could be grown in Bihar, and, by selection and hybridisation, these qualities have been successfully combined with high yielding power, rust resistance, and strong straw-yields of over 40 bushels per acre being obtained without irrigation or manure. During the years 1910-12, the trials of these new varieties were extended to other wheat-growing areas in India with the most excellent results. The new varieties were tested in the United Provinces, in the Panjab, in the Central Provinces, and in various other parts of Bihar both with and without irrigation. In all cases the yields obtained were well above the average for each district, and the grain was of high quality. A further proof. of the success of these new varieties lies in the great demand for seed which has arisen during the past few years, and which until now could only be met in part. However, arrangements have been made with three estates to grow a large stock of seed for distribution, which should be sufficient to satisfy all demands, whilst at Pusa the various strains will be maintained in pure culture for purposes of restocking.

A certain number of cultivation experiments are also being carried out at Pusa. The first, which concerns the continuous growth of a wheat without manure, shows that after five years' cropping the natural fertility of the soil is unaffected. The next deals with the treatment of the fallow ground previous to the sowing of wheat, and compares the effect of cultivating the ground during the hot weather with the more usual practice of delaying the first ploughing till after the commencement of the rains. The former system considerably increases the yields and the effect appears to be cumulative. Lastly it has been demostrated that waterlogging the land in September reduced the subsequent crop by 50 %, and this result was shown to be due to the lack of available nitrogen, caused, no doubt, by a change in the soil flora.

A considerable amount of breeding work was done during the years 1911-12 at Pusa, particularly with regard to the production of new rust-resistant varieties with high yielding powers and strong straw. Some interesting facts with regard to the inheritance of characters have been elucitated and a paper on this subject has been published. (1)

ROOT CROPS

358 – A Good Tuber Plant: *Arracacia xanthorrhiza.*

NOUGUI. A "mandioquinha" ou "batata salsa". — *Chacaras e Quintaes*, Vol. VII, No. 1, pp. 8-9 + 3 figs. São Paulo, Brazil, January 15, 1913.

Arracacia xanthorrhiza Bauer (old synonym *Arracacha esculenta* D C), an umbelliferous plant, is indigenous to the Bolivian Andes (2), where it is also cultivated under the name of "sacharachaca." It is not widely spread; it is cultivated to a certain extent in Brazil, and deserves to be grown on a greater scale, as it produces a nutritious tuber; it resists frosts, is not exacting, and yields abundantly. It thrives in all kinds of soil excepting pure clay and it allows of the utilization of poor soils which cannot be used for other crops. After ploughing the soil lightly, the side shoots of the parent plant are set at about 30 inches each way from each other. Every plant produces 10 to 15 tubers; harvesting the crop commences the second year and continues throughout the year. Interculture consists in one hoeing.

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(1) See No. 118, *B.* Feb. 1913.

(2) According to the *Index Kewensis* Tomus I, p. 193, Oxonii, 1895, *A. xanthorrhiza* is a native of Jamaica. (*Ed.*).

FORAGE CROPS. MEADOWS AND PASTURES

359 - Two New Species of Clover.

DE DEGEN, A. (Director of the Royal Seed-testing Station, Budapest) in *Mark Lane Express*, Vol. 109, No. 4246, pp. 183 and 185. London, February 10, 1913.

In the autumn of 1910, the author was twice asked to report on seed samples which consisted of a mixture of *Trifolium parviflorum* and *T. angulatum*, and this year he estimates that there are 80 tons of this seed on the market. The two plants are almost always found growing together on the heavy alkaline clay soils of the Hungarian lowlands, where they form the chief constituents of valuable pasture and meadow. They are small annual clovers, and in wet years or in wet spots produce an abundant crop; under drier conditions the plants remain dwarf and therefore produce a short crop, but always of good quality. They are both very early plants, and after the middle of June, if the season be dry, become of little value; the production of large numbers of seeds, which are easily shed, facilitates the process of self-seeding.

Wherever similar conditions of soil and climate prevail, these species will probably give equally good results, but all experiments so far show that under other circumstances the plants are of no value.

The seeds are finely reticulated, especially those of *T. parviflorum*, which otherwise resemble those of Dutch clover (*T. repens*), while the seeds of *T. angulatum* are more similar to those of alsike (*T. hybridum*).

FIBRE CROPS

360 - Cotton Industry in the West Indies.

1. - SANDS, W. N. The Results of the Cultivation of Cotton in St. Vincent.
2. - TEMPANY, H. A. The Cotton Industry in the Leeward Islands.
3. - BOVELL, J. R. The Cotton Industry in Barbados.
4. - ROBSON, W. Cotton Selection in Montserrat.
5. - ROBSON, W. The Manner of Cross-Pollination of Cotton in Montserrat.
6. - ROBSON, W. Sakellarides Cotton in Montserrat.

— *West Indian Bulletin*, Vol. XIII, No. 1, pp. 1-28. Barbados, 1912.

I. — *Cultivation of Cotton in St. Vincent*

Exports of cotton:

Financial year April 1st, 1910, to March 31st, 1911	lbs.	540 339	£ 41 836
1903-04 to 1910-11	»	2 391 884	£ 160 407

Acreage planted (1911):

Sea Island cotton 3587 acres; Marie Galante 1093 acres; Total 4680 acres.

Estimated value of the 1910-1911 crops, based on the actual yield and prices:

561 526 lbs. Sea Island Cotton at 18 *d* per lb.	42 114
752 tons » » cotton seed at £ 5 per ton	3 760
26 748 lbs. Marie Galante cotton at 9 *d* per lb.	1 003
35 tons » » cotton seed at £ 5 per ton . .	175
Total estimated value . . .	47 052

Percentage of lint to seed cotton: 24 (Marie Galante, white) to 26.5 (Sea Island, white, and Marie Galante, stained).

Cotton growing is now the chief industry of St. Vincent. The Government Central Cotton Ginnery, managed by the Agricultural Department, is the largest in the Colony and deals with more than half of the cotton output. Under an Ordinance of 1909 all lots of seed cotton less than 100 lbs. in weight have to be sold to the Government Central Ginnery. The largest quantity, however, which can be purchased from any one grower without the permission of the Administrator is 4 000 lbs. The Central Ginnery anticipates one-quarter of the estimated value of the lint per lb., less 5 c. for ginning and shipping charges and export duty. At the end of the crop, a bonus equal to three-quarters of the net profits is distributed. This system of sale has encouraged cotton-growing by the peasantry. In 1911, 542 small planters grew Sea Island cotton on 916 acres. Selected and disinfected cotton seed is furnished to them at a low price by the Department of Agriculture.

Under the provisions of the Cotton Disease Prevention Ordinance of 1910 all growers are required to destroy by fire all cotton bushes of the previous cotton season on or before April 30 in St. Vincent and on or before March 31 in the Northern Grenadines. The Ordinance does not apply to the Southern Grenadines, where practically only the perennial Marie Galante cotton is grown.

Pests and Diseases. — No attack of the cotton worm (*Alabama argillacea*) has been recorded during the past four years; its chief natural enemy, the Jack Spaniard (*Polistes annularis*) is now protected on nearly all estates. The local cotton stainer (*Disdercus delauney*) is always found in large numbers towards the end of the crop. It is advised to destroy, besides the cotton plants toward the end of the season, other plants which supply food to this insect pest, that is the silk cotton (*Eriodendron anfractuosum*, John Bull or Mahoe (*Thespesia populnea*), Tobago bread nut (*Pachira spruceana*) and Ochro (*Hibiscus esculentus*). Damage was also caused by the leaf blister mite (*Eriophyes gossypii*) and black scale (*Saissetia nigra*). *Bacterium malvacearum* and anthracnose (*Colletotrichum gossypii*) were the most dangerous diseases.

2. — *The Cotton Industry in the Leeward Islands.*

Acreage planted (1911-1912):

Antigua	517 acres	St. Kitts	1650 acres	Montserrat	2500 acres (estimated)
Barbuda	130 »	Nevis	2000 »	Anguilla	800 » (estimated).

Cotton crop of 1910-11 in Antigua: 96 992 lbs. of lint; average yield 173 lbs. par acre.

Exports of lint (1910-1911):

St. Kitts	329 322 lbs.	Total return of lint per acre 216 lbs.
Nevis	343 395 »	
Anguilla	148 595 »	
Montserrat	109 000 »	(Up to November 1911).

In Anguilla, the young crop has suffered very much from the attack of a small beetle which cuts down the young plants. At Montserrat the growth suffered from the attacks of the cotton stainers (*Dysdercus andreae*) and of the flower-bud maggot (*Contarinia gossypii*).

3. — *The Cotton Industry in Barbados.*

Acreage under cotton from 1906-7 to 1910-11. . . . . . . 28 824 acres
Average yield: Cotton lint 4 549 870 lbs. of the value of £ 285 740
» seed 11 144 421 » » » £ 24 791

The average production per acre, which was 338 lbs. of lint in 1902-1903 when cotton cultivation was begun in Montserrat, has constantly diminished and was in 1910-11 153 lbs. In order to counteract this evil, the Department of Agriculture has undertaken work for the improvement of the quality and quantity, either by selection or by crossing selected Sea Island cotton with very hardy varieties. The results so far obtained confirm those found by O. F. Cook of the Department of Agriculture of the United States, in that the hybrids proved to be very variable. These showed parental characters (those of the parent plants), interparental characters (intermediate), extraparental characters (not within the parental groups or between them). The latter could be divided into suppressed, intensified and primitive characters.

By the continued selection of a cotton which in 1908 had fibres 36.1 mm. long and 35.7 per cent. of weak fibre, and in 1909 yielded 2376 lbs. per acre of unginned cotton, in 1911 a variety, Grant, was obtained with fibres 46.2 mm. in length, 14.4 per cent. of weak fibre and producing 4 406 lbs. per acre of unginned cotton.

In 1909, this cotton was estimated at 11*d.* per lb. in 1911 at 16 to 17*d.* per lb., taking Sea Island cotton at 17 to 19*d.* per lb. as a base.

4. — *Cotton selection in Montserrat.*

Cotton selection has been carried on uninterruptedly at Montserrat since 1906. The following method of perpetuation of a particular strain is adopted. The seeds of the plant selected in 1909 are planted in the breeding plot in 1910. In this year six of the plants are marked and the seed-cotton collected into separate bags, the lint is submitted to spinning tests and the seeds of the two plants showing the most desirable features are retained for planting in 1911. The two plants in 1911 are treated as if they were separate strains, and six plants are again re-selected and the seed-cotton collected separately, from both types, the lint of the twelve plants being subsequently examined. Thus the inheritance both for breeding qualities (yield) and lint characters comes into perspective, and the type showing the best all-round features is perpetuated.

In the course of these selection experiments it has been shown that the germinating power of seeds can be destroyed by the heating of seed-cotton and also when seeds are stored in bulk after ginning. As a rule cotton seeds show a high germinative power as they come from the field, but when the cotton is picked, this is not always the case. This suggests the necessity for making germination tests before deciding which seeds are to be reserved for planting purposes. Thorough sunning of the seed-cotton before storing should obviate the possibility of heating, and subsequent to ginning the seeds should not be stored in large bulk.

5. — *The Manner of Cross-Pollination of Cotton in Montserrat.*

A large number of insects have been found in Montserrat associated with the cotton plant, such as the Jack Spaniard (*Polistes* sp.), lacewing flies (*Chrysopa* sp.), lady-birds, grasshoppers, *Syrphus* or hovering flies, etc. More closely associated with the flowers were beetles, ants, honey bees, one or more species of small Dipterous flies and an unidentified species of thrips. The Dipterous flies and the thrips may aid self-fertilization to a little extent. While the bees *Dielis dorsata, Centris haemorrhoidalis* and *Megachile* (?) *martindalei* carry pollen from one flower to another. The average percentage of flowers cross-pollinated by *D. dorsata* is thought to be 21, ranging from 4 on a dull, showery day to 33 per cent. on a bright day.

6. — *Sakellarides Cotton in Montserrat.*

The following are the results of preliminary experiments conducted at the Experiment Station in Montserrat during 1911-1912.

Yield of seed cotton: plot *a* (1/25 acre)	1 475 lbs. per acre
» *b* (1/4 ») about	936 » » »
Number of bolls required to make 1 lb. of seed cotton	138
Average lint length.	1 ½ in.
Percentage of lint in selected plants	30
Weak fibre eliminated by means of the weaver's comb.	11.8

The behaviour of the plants on the whole indicates that this type will prove to be hardier and a heavier cropper than the Sea Island cotton.

361 - **Cotton Experiments in the Cape Province.**

VAN RYNEVELD, A. in *The Agricultural Journal of the Union of South Africa*, Vol. IV, No. 6, pp. 831-842+XII plates. Pretoria, December 1912.

Attempts at growing cotton have been made in various parts of the Cape Province, but the absence of any system of experiment and the want of the necessary supervision have made the results practically useless. A large portion of the Cape Province is not suited to the growing of this crop, and it was resolved to test the suitability of a certain area where the conditions of labour, soil, climate, and rainfall seemed to indicate the best chances of success. The site chosen was at the Big Umgazi, in the District of Port St. John's, Pondoland. The soil consists of a rich, dark, heavy sandy loam, and was moderately moist at planting time.

Ten pounds of seed was used per acre. The land was only ploughed up once, namely just before planting, and harrowed. A shower of rain (about 0.35 in.) fell the evening after planting. Plants were thinned out when 14 days old and again at one month. The perennial varieties — that is the Sea Island and Egyptian — were planted from 5ft. to 7ft. apart in the rows. The rows of the rest were 4 ft. apart. The annexed table shows the results obtained :

Date of planting	Variety planted	Height of Plant		No. of Bolls to Plant		No. of Bolls to 1 lb. of Seed Cotton		Percentage of stand	Size of Plot	Yield per acre
		Selected	Average	Selected	As found	Selected	As found			
		in.	in.						acres	
1911 October 28	Sea Island.	102	78	188	150	89	112	99	5	1 369.8
» 29	Egyptian Mitafifi. . .	102	78	222	99	98	119	94	3	1 285.6
» 29	American Toole . . .	60	51	130	71	66	75	80	2	2 067.5
» 30	Nyasaland Upland . .	72	60	168	97	68	73	52	3½	1 548.2
» 30	Cleveland Big Boll . .	54	48	59	39	43	52	100	½	1 010.0
» 30	Herlong	48	45	57	34	—	—	100	½	810.0

The Sea Island and Egyptian varieties grew out almost too luxuriantly, so that the sun was excluded to a great extent and only about half of the bolls ripened. The annuals also grew out well and gave very satisfactory yields.

Weather conditions were favourable during planting time, but a protracted period of drought set in when plants were about six weeks old. The crop was freely cultivated and a certain amount of hand-hoeing was also done to keep the field clear of weeds.

The following is the cost of production and estimated profit per acre of the different varieties planted :

	£.	s.	d.
Sea Island			
Preparing and ploughing	0	10	0
Harrowing	0	1	0
Planting	0	1	0
Seed	0	1	0
Chopping (thinning out)	0	2	0
Cultivating and hand-hoeing	0	12	0
Picking	1	16	0
Transport	0	4	0
Wear and tear of implements	0	1	0
Sundries	0	2	0
	3	10	0

	£	s.	d.
1 369 seed cotton at 3 *d*. per lb.	17	2	3
Less cost of production	3	10	0
Estimated profit per acre	£ 13	12	3
Mitafifi			
1 285 lbs. seed cotton at 3 *d*. per lb.	16	1	3
Less cost of production	3	0	0
Estimated profit per acre	£ 13	1	3
American Toole			
2 067 lbs. seed cotton at 3 *d*. per lb.	25	16	2
Less cost of production	3	10	0
Estimated profit per acre	£ 22	6	9
Nyasaland Upland			
1 548 lbs. seed cotton at 3 *d*. per lb.	19	12	0
Less cost of production	3	0	0
Estimated profit per acre	£ 16	12	0
Cleveland Big Boll			
1 010 lbs. seed cotton at 3 *d*. per lb.	12	12	6
Less cost of production	2	15	0
Estimated profit per acre	£ 9	17	6
Herlong			
810 lbs seed cotton at 3 *d*. per lb.	10	2	6
Less cost of production	2	15	0
Estimated profit per acre	£ 7	7	6

The cost of production per acre varies in the different varieties owing to additional cost of picking of one variety as compared with another. The cost of picking was higher in the case of the Sea Island owing to the bolls not opening well and in the case of the Toole owing to the heavy yield.

The second year crop of the Sea Island variety is of very good quality and of satisfactory yield.

The only insect pest which troubled the field in question was cotton stainer (*Dysdercus superstitiosus*) but not to any great extent.

362 - Cotton Experiments in British Guiana.

HARRISON, J. B. and STOCKDALE, F. A. in: *West Indian Bulletin*, Vol. XIII, No. 1, pp. 40-55. Barbados, 1913.

Experiments in growing different foreign varieties of cotton have been in progress for some time (*West Indian Bulletin*, Vol IX, pp. 213-214). None of the varieties grown however paid for the cost of their cultivation, so that these experiments were discontinued after 1908, and attention was given to producing hardy varieties suitable for the heavy clay soils of the coastal region.

The writers give tables incorporating the data resulting from the observation of 103 hybrid Sea Island and Buck plants (indigenous variety) of four generations (100 individuals per generation) F_1 ; of 274 F_2 plants; of 436 F_3 plants (derived from the seeds of 7 F_2).

While refraining from discussing these data in detail, until those from a further generation are available, the writers state that it is now possible to select, even in three generations, cottons that seem to be practically true to type. Variety 59.66, an extracted sea Island cotton, grows vigorously on heavy clay soil and under meteorological conditions where the ordinary commercial strains of this cotton refuse to grow. Variety 59. 33 is also interesting from its short staple cotton and comparatively early maturity.

Trials have also been made in crossing indigenous cottons from the Rupununi district with Sea Island, and the results seem encouraging.

363 - Action of Light on the Growth of Seed Beets.

SUGAR CRO

STROHMER, F. Einfluss der Belichtung auf das Wachstum der Samenrüben. — *Mitteilungen der chemisch-technischen Versuchsstation des Zentralvereines für die Rübenzuckerindustrie*. Serie IV, No. 41. *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLI, Part 6, pp. 913-931. Vienna, 1912.

In a preceding work of Strohmer, Briem and Fallada (*Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XL, 1911, p. 11) it has been demonstrated that a lack of light during the first year of vegetation causes in beets a considerable development of the leaves at the expense of the root, and modifies unfavourably the composition of the dry matter of the root from an industrial point of view by diminishing its sugar content. The writers proposed to ascertain if in the second year of vegetation the lack of light favours the development of the upper part of the plant at the expense of the lower and whether it increases the production of seed or modifies its characters.

The first series of experiments, like the preceding ones, was conducted at the Wohanka station for the production of beet seed at Uholiczky near Prague. Three one-year-old beets (I, II, III), of equal weight and sugar content (18.0 per cent.) were halved, one of the halves (*a*) was planted so as to receive the sunlight for three quarters of the day, the other half (*b*) was placed under some trees so as to be always in the shade. The results obtained in a dry year, 1911, are shown in Table I.

TABLE I.

	I		II		III *	
	(a) half	(b) half	(a) half	(b) half	(a) half	(b) half
Weight of seed . . . . . grams	98	25	106	28	2.3	1.4
» » stems and leaves »	134	57	132	69	71	2.6
» » roots . . . . . »	85	55	92	58	62	14.0
Seed clusters, weight per cent. of those produced by (a) halves	—	25.5	—	26.4	—	6.1
Number of clusters in 1 gram .	78	94	74	84	90	111 *
Size of clusters . . . . . mm.	3.5–4	3–3.5	3–3.5	3–3.5	3–3.5	3

* The beet was not perfectly sound.

In the germination tests no essential difference was observed between the seeds produced in the sunlight and those in the shade.

The seeds of this generation were used in cultivation experiments carried out, with the usual tillage and manuring, in 1912 at Gross Zinkendorf, Hungary and at Dürnkrut, Lower Austria. Numerous and detailed tables give the meteorological observations, cultural and analytical results. Table II. refers to the sugar content.

TABLE II. — *Sugar Content of Beets.*

Experiments at Gross-Zinkendorf.

	Offspring of the half kept in the sun				Offspring of the half kept in the shade			
	Number of beets analysed	General average %	Maximum %	Minimum %	Number of beets analysed	General average %	Maximum %	Minimum %
Beet I . . .	58	**19.80**	21.00	17.60	57	**20.18**	21.20	18.00
Beet II. . .	59	**20.04**	21.00	19.10	58	**19.88**	21.45	18.40
Beet III . .	18	**19.74**	20.90	18.25	18	**19.42**	21.00	17.30

Experiments at Dürnkrut.

	Offspring of the half kept in the sun				Offspring of the half kept in the shade			
Beet I . . .	18	**18.43**	19.25	16.60	16	**18.26**	19.20	16.40
Beet II. . .	17	**18.61**	19.40	18.05	18	**18.25**	19.20	16.10

The results obtained show "that the lack of sunlight acts unfavourably on the development of the parent beets to the extent of diminishing the production of seed clusters. The size of these is inferior to that of normal clusters and they often give rise to weak plants. Nevertheless, when the latter have attained a normal development, their yield, sugar content and chemical composition does not allow an unfavourable effect of the lack of sunlight on the parent root to be recognized; so that such offspring is perfectly equal to that of beets of the same kind grown under perfectly normal conditions."

These results agree with others obtained by the same writer (*Oesterr.-Ung. Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XXXIX, 1910, p. 919) which show that the character of sugar content of beets is preserved even through a generation grown under different climatic conditions. It may thus be affirmed that the sugar content of beets deriving from individual selection is a hereditary and transmissible character.

304 - Cultural Accounts and Production of Sugar Cane cultivated on the Share System.

Resultado del costo de la caña de azúcar cultivada por colonos, segun las prácticas adoptadas en Cuba. — *El Hacendado Mexicano*, Year XIX, Vol. 10, pp. 52-53. Mexico, February 1, 1913

It has been suggested to employ colonists for the cultivation of sugar cane and to purchase and work up their production in large central factories. But as far as the writer knows the advice has been followed only on one estate near Tampico, where it has given excellent results. In order to show the advantages of the system the writer quotes the example of Cuba, where it is common, and gives the following data referring to the system, which are taken from official documents and from Cuban sugar factories.

Crop of canes: average (60 000 arrobas per caballeria)	45 235 lbs. per acre
good (80 000 » » »)	60 313 » » »
Yield of sugar from average crops:	
average yield 12 per cent.	5 428 » » »
good yield 12.5 per cent.	5 654 » » »

The factory gives the grower on the share system from 40 to 52 % of the sugar extracted from the canes he delivers, namely:

a) average crop, yield of sugar 12 per cent.	
giving the growed 40 per cent. of the sugar	2 388.32 lbs. per acre
at $2.80 per cental	$66.87 » »
b) average crop	
giving the grower 48 per cent. of the sugar	2 605.44 lbs. » »
worth	$77.95 » »
c) average crop	
giving the grower 52 per cent. of the sugar	2 822.56 lbs. » »
worth	$79.03 » »
d) good crop	
giving the grower 40 per cent. of the sugar	2 895.00 lbs. » »
worth	$83.67 » »

Cost of production of 1 acre.

Preparation of the soil	
Clearing	$1.50 to 10.00
First ploughing	4 — » 6.20
Second »	2.70 » 3 —
Harrowing	1 — » 1.25
Preparation of the beds	1.25 » 1.65
Total	$10.45 to 22.10
Sowing	
Canes	$4 — to 5 —
Carriage	0.50 » 0.70
Cutting into pieces	0.50 » 0.80
Planting of pieces	2.50 » 3.50
Covering with earth	3 — » 3.80
Total	$10.50 to 13.80
Interculture	
Cost of three hoeings	$10.55 to 12.60
Cutting the canes and carriage to the mill	
Cutting and loading	$12 75 to 18 —
Carting	9 — to 18 —
Total	$21.75 to 36 —
General total	$53.25 to 84.50
Cost of renewing the seed	$15 per acre

Balance of a plantation lasting six years and yielding 45 235lbs of canes per acre per annum.

Sowing, interculture, and cutting the first crop		$ 60 per acre
Interculture and cutting each successive crop: $10 per acre for five crops		200 » »
Cost of production of six crops		$260 » »
Canes produced per acre: 45 235lbs.; sugar 12 per cent.; share of the grower 48 per cent. of the sugar, that is	2 605.44lbs. per acre	
at $2.80 per cental	$72.95	
and for the six years	$437.70	
Difference between outlay and returns for the six years	$177.70	

From this difference the fixed expenses are to be deducted. These are estimated as follows for a farm of 3 caballerias (about 100 acres):

Construction of dwelling	$300
Nine yoke of oxen	900
Two horses	130
Implements	220
Enclosures	250
Pasture for live stock	60
Carts for trasport of cane	140
Total	$2 000

Share per acre of above expenses	$20.25
Interest at the rate of 8 per cent. for 6 years and per acre.	9.72
Depreciation 40 per cent	8.10
Total fixed expense per acre after six years	$17.82
Difference between the value of the sugar delivered to the grower and the cost of production of the cane, for six years	$177.70 per acre
Fixed expenses for six years	17.82 » »
Profit during six years	$159.88
Yearly profit.	20.64

The above profit refers to average soils and years ; under favourable conditions a profit of $40 to $45 per acre and upwards may be realized.

RUBBER, GUM AND RESIN PLANTS

305 - The Yield of Hevea in Java.

DE WILDEMANN, E. La Production de l'Hevea à Java. — *Le Caoutchouc et la Guttapercha*, Year 10, No. 108, p. 6 995. Paris, February 15, 1913.

BERKHOUT, A. H. L'Hevea à Java. — *Bulletin de l'Association des planteurs de caoutchouc*, Vol. V. No. 2, pp. 38-39. Antwerp, February 1913.

Dr. P. Arens has published a study on the yield of some Hevea plantations (1). The experiments dealt with the trees of six plantations and the yield per tapping varied from 1.05 to 2.94 grams. In the year one can reckon upon 180 days in which tapping is done, which gives a yield per tree and per year of 348 to 648 grams. A first conclusion can thus be drawn that in Java, trees from 5 to 7 years old can produce an average of 500 grams (over 1 lb.) of rubber per year. Another point to which the writer draws attention is the lower yield of plantations in which the trees are crowded. It appears also from observations made in Java that daily tappings are more productive than those made every other day. Dr. Berkhout, former conservator of forests in Java, observes on the other hand that the yield in Java is not inferior to that obtained in the Malay peninsula.

Among many other plantations situated in the Island of Java, the writer mentions only those in the Preanger Regency. In the plantation of the Bajabang company, during the first year of tapping, the tappings commenced in January on 22 800 trees were extended to 42 835 trees in December with a total production of 26 730 lbs. In the plantation of the Tjondog company 21 000 trees yielded 2 628 lbs. per month and an average of 750 grams (1 lb. 10 oz.) per tree tapped was expected for the first year. In the plantations of the Franco-Dutch Colonial Planting Company the first trees were tapped at the age of only 4 years. In 1911, 104 890 trees were tapped, yielding 171 310 lbs. The yield according to age was as follows :

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(1) *Proefstation de Malang, Bull. No. 3, Java.* (*Author's note*).

	Grams per tree
Trees planted in 1904	1 270
» » 1905	[illegible]
» » 1906	[illegible]

These figures, higher than those quoted by M. Arens, seem to M. Berkhout to leave no doubt as to the normal yield of thriving trees in a well-managed plantation.

366 - On the Existence in West Africa of Two Stable Forms of *Hevea brasiliensis* with Different Rubber Yields.

BRET, C. M. Sur l'existence, en Afrique Occidentale de deux formes stables d'*Hevea brasiliensis* à rendement différent. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 6, pp. 478-479. Paris, February 10, 1913.

Hevea brasiliensis, which is almost exclusively cultivated in the rubber plantations of the Far East, has hitherto given rise to very slight variations from the usual type. The writer, during the time which he lived on the West Coast of Africa, had occasion to observe two *Hevea* plantations; the trees were not of the same origin and their latex yield appeared to be different.

One of the two varieties, which formed a stand of 70 trees at Dabou (Ivory Coast), was more vigorous in appearance than the other, from which its anatomical characters distinguished it very clearly. The latter, of which there was a stand of 6 trees at Porto-Novo (Dahomey) yields a larger amount of rubber.

The characteristic anatomical difference consists especially in the fact that in the high-yielding form the swollen basis of the petioles has a number of laticiferous tubes in the cortical parenchyma, especially on the ventral surface, and in the liber, while in the more vigorous Dabou form the laticiferous tubes are much less numerous.

These two forms of *Hevea* have a different origin; the trees in the Dabou stand were grown directly from seed collected on the Lower Amazon, while the Porto Novo trees came from the Ebute Meta station (Lagos), having been sent out from the Royal Botanic Gardens at Kew.

The writer's experiments show that the offspring of these two forms retain the characteristic differences in vigour and yield, even under different conditions from those prevailing where they were first observed.

The easy method which allows these forms to be recognized by the observation of the anatomical structure of the base of the petioles is to be recommended, as it might be used to effect a rapid selection.

367 - Manihot and Hevea.

Manihot et Hevea. — *Journal d'Agriculture Tropicale*, Year 13, No. 139, pp. 7-10. Paris, January 31, 1913.

In an article signed F. V. (1) the question of the advisability of cultivating Manihot and Hevea side by side was raised and answered affirmatively. Further, as M. Girard, who has practised this mixed cultivation in Cochin-China since 1910, using *M. dichotoma* and *pianhyensis*, asked for information respecting the best methods of tapping, for only by means of applying tapping methods entirely satisfactory to himself, would he be able to give, in his turn, interesting information on the mixed cultivation of Manihot and Hevea in Cochin-China and on the results of his experiments in incising Manihot trees. It was thus useful to add to the information which M. F. V. was able to furnish on this subject the data collected by M. V. Cayla in the course of a visit to the Brazilian plantations of various species of Manihot.

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(1) See *Journal d'Agriculture Tropicale*, No. 132, June 1912. (*Ed.*).

The following method is advocated by M. F. V. as the result of his practical experience on the Congo.

1. The thick bark of the trees should be removed in order to obtain a smooth clean surface.
2. The tree should be divided into 4 sectors and the incisions made in the form of half a fish-bone to a height of 6 ft 6 in. from the foot of the tree and 6 in. apart.
3. One sector must be incised per day and the next day the scrap should be removed, the incisions being sprayed with Bordeaux mixture. As soon as the cuts have cicatrised, the process is repeated, the new incisions being made below the former ones.
4. The best time for tapping is before 8 a. m., but it can be continued during the day in the case of trunks in the shade.
5. An ordinary implement is used, care being especially taken to avoid injuring the cambium.
6. No tree should be tapped till it is 4 years old.
7. The latex should be allowed to coagulate without being disturbed, and preferably in the form of " crêpe ".

M. V. Cayla states that in Brazil in the State of Rio Janeiro, it is necessary to remove the thick bark from *Ceara* trees (*Manihot Glaziowii*) of from 7 to 8 years of age, or more, in order to make clean-cut fish-bone incisions. In the case of the other species of Manihot, a rapid and slight scraping with the cutting knife is all that is requisite.

M. Glaziowii is tapped with a " machadinho " (1) according to the method of the " seringueiros ", but *M. pianhyensis* (" pianhy ") and *M. dichotoma* (" jéquié ") are treated in a still rougher manner; while the latex from *M. Glaziowii* is collected in receptacles (" tigelinhas ") suspended from the trees below the incisions, that from *M. dichotoma* flows into a vessel at the foot of the tree, while the latex exuding from *M. pianhyensis* flows into a hole dug in the ground.

The fish-bone incision is not practised in Brazil, where it would not be economical in the case of *Ceara* on account of the peculiar nature of the bark of this tree.

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(1) A small axe used by the " manisobeiro ", Cfr. *Le Manisoba* by [illegible], Paris, Challamel, 1906. [illegible] (Ed.)

But the diameter and height of the Manihot trees depend on cultural methods, which seem to be completely ignored in the State of Bahia, where the want of care taken does not permit of stating with accuracy the height to which incisions can be made. The trees are tapped as high as possible; small incisions can be made in nearly half the circumference of the trunk of *M. dichotoma* without causing any injury to the tree.

As for the age, it is better not to begin tapping too early. Nevertheless, *M. pianhyensis* is often tapped when 2 years, or even 18 months old and the dead tree is replaced by a fresh productive tree grown in 6 months by filling up the gaps with slips.

The rubber from the Brazilian species of Manihot coagulates of its own accord; its quality is good and it fetches a high price. It is, however, deficient in purity, but this might be remedied by filtering the latex before coagulation, pressing and drying the coagulum with care.

368 - Technological Study of the Congo Varieties of Rubber.

Étude technologique de Caoutchoucs du Congo. — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 62, p. 63. Melun, February 1913.

1. Rubber from Oubangi: *Funtumia elastica.* — Being little vulcanised, this is less tenacious, less resilient, less elastic, more supple and more extensible than " fine Para hard cure ". But when more vulcanized it is equivalent to it. It is a rubber quite comparable with the best wild Para kinds.

2. Rubber from the Upper Chari: *Landolphia ovariensis.* — Extracted by pounding the rhizomes of dwarf varieties of *L. ovariensis*. This is a liana rubber of average quality.

VARIOUS CROPS

369 - Study of *Coffea robusta* (1).

DE WILDEMANN, E. Etude sur le *Coffea robusta*. — *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. IV, Nos. 3, 4, 12, and Vol. V, N°. 2, pp. 54-56, 78-79, 274-276 and pp. 28-31. Antwerp, March, April, December 1912 and February 1913.

For some years past, the question of *Coffea robusta* and of its cultural value has been dealt with in all Colonial Agricultural Journals. In this article, the writer has collected all the data, which seem favourable to a large extension of the cultivation of this plant. Already in 1909, he maintained, in a paper contributed to the *Annales du Jardin Botanique de Buitenzorg* (2), and containing an exhaustive bibliography of the cultivated varieties of *Coffea*, that *C. robusta* is not a species, but a variety or form of *Coffea canephora*, indigenous in Central and West Africa.

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(1) This plant, which has been collected by M. Ed. Luja in the Belgian Congo and by M. Chevalier in the French Congo, is known in some recent treatises under the name of *C. robusta* Chevalier. It is not mentioned in the *Index Kewensis* and supplements issued up to 1908. The seeds for the plantations in the Dutch East Indies came from Brussels. *(Ed)*.

(2) Materiaux pour une étude botanico-agronomique du genre *Coffea* (Caféiers cultivés). *Annales*, Series 2, Suppl. III. Java. *(Author's note)*.

C. robusta, when carefully cultivated, forms a shrub with horizontal or decumbent branches, which at the flowering and fruiting seasons, literally bend beneath the weight of the flowers and fruit. This productivity is one of the characteristics of the variety from the economic standpoint; for no other kinds of cultivated coffee plants bear so many seeds. Another important characteristic which must be dwelt on is its early maturity; it is in full bearing long before *C. liberica* and *C. arabica* and before *Hemileia* has developed sufficiently to hinder its fructification to any noticeable extent.

But the success of *C. robusta* is especially due to the fact that it will grow between *Heveas* and to the economic results obtained by using it as a grafting stock (3).

UNITS OF YIELD. The yield of this plant is one of the most remarkable; the following table published by the *Jaarbock* of the Department of Agriculture of Java, gives the crop from different coffee plants of the same age and grown under identical conditions:

	Weight of seeds per plant	
Java coffee.	53 to 97	grams
Maragogype	14 to 18	»
Moka (small berries) . . .	27 to 38	»
Moka (large berries) . . .	118	»
Robusta	992	»
Quillou	1020	»
Maragogype on Quillou .	26	»
» » Robusta .	156	»
Eugenifolia.	20 to 133	»
Lancifolia	10	»
Erecta	43	»
Cochleata	12	»
Rotundifolia	40	»
Laurina	83	»
Unisperma	20	»
Columnaris	17	»
Angustifolia	60	»

The two African varieties, *Quillou* and *Robusta*, are the ones which give the highest yields, while *Maragogype* grafted on *Quillou* produces 26 grams of seed per tree and on *Robusta* 156 grams per tree, which is a larger crop than any produced by the cultivated varieties formerly grown in Java.

SELECTION. An interesting question has been raised of late as to the flavour and commercial value of the coffee from the different varieties of coffee plants; this leads to a consideration of the necessity of improving the cultivated species and varieties by means of selection.

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(3) This association of crops occurs in Sumatra and Java; *C. robusta* has also been advantageously employed as an intercalary crop in coconut plantations. See No. 40, *B.* Jan. 1913. (Ed.).

This is the more important, contrary to what has been affirmed respecting other species of *Coffea*, and especially by Dr. von Faber as regards *C. liberica*, seeing that self-fertilization never takes place in the group of *Coffea canephora* to which *C. robusta* belongs; cross-fertilization is the invariable rule. This being the case, it is necessary to protect the plant from bad qualities being introduced by strange pollen. Very careful selection is therefore necessary to ensure good returns and, according to Dr. P. S. Cramer, attention must be directed to the following points:

1. Growth, resistance to fungoid leaf diseases, ramification.
2. Annual production, early ripening of crop, distribution of flowering periods throughout the year.
3. Crops, proportion between good and aborted seeds, thickness of the testa of the fruit.
4. Shape, colour, size of berries.

All selection work, however, presupposes a knowledge of the forms to be adopted and the value of their produce; unfortunately much confusion still prevails in these matters, as is shown by the different opinions summarized by the writer as to the determination and classification of the various kinds of coffee cultivated.

Mr. Wurth, of the Special Coffee Station at Java, divides the cultivated varieties of coffee plants into 3 groups of which the types are *C. arabica*, *C. liberica* and *C. robusta*:

Arabica: *congensis*, *stenophylla*.
Liberica: *abeocuta*, *excelsa*.
Robusta: *canephora*, *Quillou*, *Uganda*.

Mr. Wildeman, on the contrary, considers *robusta* as a variety of *canephora*, and *Quillou* as identical with *C. canephora* var. *Sankaruensis*, which together with *robusta* and *Laurentii* are a sort of *canephora* exported with the latter varieties from the Congo. At all events, if *Coffea arabica* seems to be very variable, this is equally the case with *C. canephora*, and it is impossible yet to be sure whether the *Quillou* variety grown in Java is actually the *Kouilouensis* (Pierre), variety of *canephora*, or another African variety of the same species, or even a new local form derived from a plant introduced into Java. All these questions, which are of great scientific and practical importance, still remain to be solved.

CULTURAL EXPERIMENTS. In Java, the answer to these problems is being sought by means of comparative experiments of the greatest interest. The results of Dr. Cramer's study of the proportion of fresh fruit to the berries ready for sale are all in favour of the *canephora* group and therefore of *Coffea robusta*, seeing that 4 or 5 lbs. of its fresh fruit furnish 1 lb. of berries, while in the case of *liberica* and *Coffea arabica* 7.85 to 15 lbs. and 5 to 6 lbs respectively are necessary to supply the same weight of coffee berries ready for the market.

Other experiments undertaken for the purpose of ascertaining whether the *Quillou* variety was suitable for planting on the sandy soils of Kloet in Jáva showed that:

1. In the majority of cases *Quillou* thrives as well as *robusta* in the Kloet nurseries and it is only very rarely more backward in growth than the latter.
2. Shortly after being planted out, both varieties develop equally well.
3. Until its second year, the *Quillou* variety grows a little less rapidly than *robusta* on the Kloet soil, but after this period it makes up for lost time and becomes as vigorous as the latter. Their value consists in the uniformity of the type.
4. Under the present conditions, the yield of *C. Quillou* on the soils of Kloet is less than that of *C. robusta* when grown in the same circumstances.
5. In the district in question, *C. Quillou* is of less cultural value from a general point of view than *C. robusta*.

Other cultural experiments have, however, not given the same results. When the ***Uganda, Robusta*** and ***Quillou*** varieties are planted so as to compare them with each other and using ***Leucoena glauca*** as a shade tree, if they are cut at a height of 5 feet and placed 10 ft. × 10 ft apart, they give the following amount of coffee ready for the market.

Uganda . . .	10.44	piculs per bouw	or about	800	lbs. per acre
Robusta. . .	16.60	»	»	1250	» » »
Quillou . . .	21.21	»	»	1600	» » »

Cultural Methods and Shade Plants. — It is necessary to choose, by means of preliminary experiments, the variety of coffee to be cultivated; this however, is not all, for the cultural methods most suitable to the given variety must be selected and the variety of shade plant to be used. The experiments of M. Boon in the experimental plantations of the Dutch East Indian Government at Bangalan, Java, show that the yield of the same variety varies with the shade plant employed.

Ratio of yields of cultivated coffee plants grown under the following shade plants:

Solanum grandiflorum	1.59
Adenanthera pavonina	1.82
Casalpinia arborea	2.17
Acacia tomentosa	2.43
Hevea brasiliensis	2.77
Albizzia moluccana	2.82
Pithecolobium Saman.	3.06
Grevillea robusta	[illegible]
Erythrina lithosperma	[illegible]
Leucoena glauca	[illegible]

EXTENSION AND PROGRESS OF THE CULTIVATION OF *C. ROBUSTA*. — In order to obtain an idea of the popularity enjoyed in Java by coffee plants belonging to the *canephora* group, it is only necessary to consult statistics on the subject and especially those compiled by the Agricultural Syndicate of the Dutch East Indies. According to the latter, 24 521 000 plants of *C. robusta* have been planted in the 4 years from 1907 to 1911. The statistics of yield and of plantation communicated at a meeting held at Malang in May 1912, gave the following figures for plantations:

	1911 Crop	1912 Estimate	Plantations 1911-1912
C. robusta and species of the same group	54 685 cwt.	94 312 cwt.	4 686 542 trees
Java	42 873 »	74 460 »	—
C. liberica	15 616 »	9 164 »	12 150 »
Hybrid	1 763 »	3 445 »	80 170 »

These few figures, although incomplete, seem to justify the opinion expressed by Prof. Treub, late Director of the Buitenzorg Botanic Gardens, that soon 60 000 tons of Javanese coffee of Congo origin may be expected on the market. They also show very clearly the progress made in the cultivation of the *canephora* species. The same is affirmed to be the case in Madagascar, where the *canephora* variety is preferred to the *liberica* on account of its early and abundant crops, of which the commercial value exceeds by 8*s.* or 12*s.* per cwt. that of the *liberica* coffee from the same district.

Nevertheless, the cultivation and exploitation of the coffee plant in Africa have made but little progress in comparison with the extension of the cultivation of coffee from the centre of Africa, which has taken place in India and the Far East. It should, however, be added that coffee is increasingly grown in some of the German colonies in Africa.

The area under coffee in 1909 was estimated at 1 976 acres in Usambara, and the amount of coffee which could be obtained in Massai was reckoned at 2.2 lbs. per tree, 400 trees being planted per acre.

DISEASES AND ENEMIES. — Dr. H. Morstatt, of the Amani Botanical Station has published a long list of the fungoid and insect pests which attack the coffee plants of this colony (1).

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(1) Dr. H. Morstatt. Die Schädlinge und Krankheiten des Kaffeebaumes in Ost-Afrika. *Beiheft zum Pflanzer*, Amani, July 1912.

(Author's note).

Hemileia is now found in all the tropical regions of the globe and though *C. robusta* is more resistant than the other species, it seems not to be completely immune from this parasite. In 1903-04, M. E. Laurent brought back from the Congo numerous specimens of the *canephora* and *robusta* groups of which the branches and leaves were attacked by this parasite. Other diseases of *C. robusta* have been recorded.

Stem canker, due probably to a fungus, *Ascospora Caffeae*, seems to have been able to develop because the plantations were at first very thick, but its extension has been hindered by planting the shrubs further apart and by burning all infected individuals.

Cercospora caffeicola and *Xyleborus*, the Boebock of the Indians, do more damage on the *robusta* than on the *Java* and *liberica* groups; but *Corticium javanicum*, the Djamoer-oepas of the Indians (produced by *Lecanium viride*), and eel-worms seldom or never attack *robusta*.

All these considerations show how important it is not to send seeds from Africa to new plantations without having taken all the precautions necessary to the interests of the planters.

COMMERCIAL VALUE OF THE PRODUCT. — It is objected that the berries of the *robusta* group and of other African coffees are small in size and inferior in flavour; but the continually increasing quantities of these coffees sold in Holland and the satisfactory prices they fetch show that the public is beginning to appreciate them. No objections will be made to the size of the berries, when by means of careful cultivation and especially of right preparation, a coffee is obtained equal in flavour to the (old) Java and Arabian coffees.

370 - Cacao in the French Colonies.

PRUDHOMME, EM. Le Cacao dans les Colonies françaises. — *Annales de la Science Agronomique*, Year 39, No. 1, pp. 13-19. Paris, January 1913.

The amount of cacao imported into France has progressed regularly from 2000 tons in 1850 to 27 000 tons, representing a sum of £1850000 in 1911 (1).

Of this, the amount of re-exported cacao was double that consumed. The cacao imported into France during the last few years comes principally from Venezuela, Brazil, Ecuador, St. Domingo, the Gold Coast, Colombia, San Thomé, Trinidad and Haiti. The re-exported cacao was sent chiefly to Germany, Switzerland, England and Belgium. In 1911, 4 149 952 lbs. of cacao was imported into France from the French colonies (50 per cent. of duty remitted); this was divided a follows:

Guadeloupe	2 332 733	lbs.
Martinique	1 336 237	„
Congo	237 833	„
New Hebrides	88 000	„
Mayotte and the Comoro Islands	56 056	„
Madagascar	45 797	lbs.
Ivory Coast	33 174	„
Guiana	27 652	„
Réunion	2 471	„

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(1) In addition to this, 135 tons (1911) of ground cacao from Germany, Holland and Switzerland have been imported. (*Author's note*).

At Guadeloupe all the cacao plantations are to be found at "Basse Terre", where the area which can be used for this purpose is not estimated at more than 6000 or 7500 acres.

At Martinique the cacao was introduced in 1661 by means of seeds from Venezuela. The area suitable for cacao cultivation is estimated here at above 7400 acres.

The first serious attempts at growing cacao in the French Congo date from 1887 (the creation of the Libreville Experimental Garden); the first plantations were made in 1889. The latter have developed particularly on the coast zone and especially at Gabon in the district of Libreville.

At Mayotte and its dependencies this cultivation is of recent origin.

The only part of Madagascar where cacao trees have any chance of development is the coast district, approximately from Vohémar in the north and Mahanoro or Mananjary in the south. At the present time, the Madagascar cacao comes in the first place from the Tamatave district and secondly from the districts of Andevoranto, Vatomandry and Mahamoro. The first exportations were in 1896.

On the Ivory Coast, attention is beginning to be paid to the cultivation of the cacao tree. The first export of the products took place in 1900; and the excellent quality of this cacao was proved by industrial tests made in 1912 under the supervision of the Colonial Garden (*Bulletin du Jardin Colonial*, No. 108. March 1912).

Although the cacao tree has been found growing wild in certain parts of Guiana, where the climate as well as the soil are very suitable to its requirements, this tree has never been grown in the colony to any extent. It appears that this is due for the most part to the scarcity and cost of labour.

Cacao production might be a source of revenue to Cochin-China, Cambodia and South Annam, but so far the tree has only been grown experimentally in these countries.

371 - New Species of Shade Trees for Cacao, Vanilla and Coffee Plants.

CHEVALIER, A. Nouveaux Arbres d'Ombrage pour les Cacaoyers, la Vanille et les Caféiers. — *Journal d'Agriculture Tropicale*, Year 13, No. 139, pp. 27-29. Paris, January 31, 1913.

The writer mentions *Rauwolfia vomitoria* Afz., which the colonists of Gabon use to shade their cacao plantations and which he saw employed for the same purpose in the vanilla plantations in the neighbourhood of Libreville.

Rauwolfia is a small tree with a straight trunk and belongs to the Apocynaceae; it is from 16 to 26 ft. high and forms a spreading canopy. The leaves give a fair amount of shade and remain on the tree throughout the dry season. The tree can be multiplied by seeds and by cuttings using in the latter case large branches during the rainy season. The roots do not exhaust the soil and cacao trees growing quite close to these trees do not suffer in any way from their proximity.

Another shade tree grown in the Belgian Congo to protect the coffee plantations, *Eucalyptus robustus*, is recommended by the writer for Dahomey, French Guinea, South Sudan, and the Brazzaville district.

This tree not only flourishes in irrigated soil, or where the ground is damp throughout the year, but it grows also on dry plateaux occupied by the savannah type of vegetation.

At the Jesuit Mission Station of Kisantre, coffee plants have been grown under the shelter of *Eucalyptus* trees some tens years old and already 50 to 65 feet high, with a very straight trunk. These trees are vigorous, covered with fruit and free from cryptogamic disease; they are planted from 50 to 60 feet apart, while a space of 13 feet is left between the coffee plants. The latter, which for the most part belong to the species cultivated in Africa, have adapted themselves perfectly to this association.

372 – Growing *Chrysanthemum (Pyrethrum) cinerariæfolium.*

SLAUS-KANTSCHIEDER, JOH. Ueber Chrysanthemum (Pyrethrum) cinerariaefolium (die Insektenblüte). (Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich Nr. 12). — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XIV, Part I, pp. 1-8. Vienna, January 1913.

Investigations hitherto conducted on the chemical composition of pyrethrum powder and on its active insecticidal principle; cultivation, crop accounts, yield; preparation of the pyrethrum powder, its adulterations and means of detection; trade.

Chrysanthemum cinerariaefolium grows wild on the stony slopes of Montenegro and Dalmatia up to 3 300 feet above sea level. It is also cultivated in these two countries, in Bosnia Herzegovina and for the last ten years in the Quarnero islands. The greatest portion of the Dalmatian pyrethrum is yielded by cultivated plants which differ from the wild ones by their somewhat larger flowers. Insecticide powders are also prepared from *Pyrethrum roseum* and *P. carneum*, which grow wild in the Caucasian region and are erroneously called Persian insecticides.

The cultivation of these three species has been repeatedly attempted in Italy, France, Algeria and California, but hitherto these countries have not placed on the market any considerable quantity of the drug.

Cultivation of Chrysanthemum cinerariaefolium. — In Dalmatia this species is grown continuously or temporarily; the former system is mostly practised in the neighbourhood of Sebenico, Traù and on the island of Lesina; the latter all over the country, in old vineyards, or old olive groves or in plots that are to be planted to vines.

It is sown usually about the end of March, the seed being covered with ½ to 1 centimetre (0.2 to 0.4 inch.) of fine earth and then with dry leaves. Possibly seed from the wild mountain plants is used as it has been observed that the species degenerates under cultivation. The seed bed requires fairly rich, soft soil, preferably with a southern aspect. Subsequent interculture consists in weeding and eventually irrigation during the summer months. As the autumn is mild, sowing is sometines done at the beginning of September and the seedlings planted out in the succeeding spring. On average only about half the seeds give rise to plants fit to be planted out in the month of March. The soil devoted to this plant may be very calcareous or marly, and it must have a southern aspect. It is prepared in the preceding autumn, being arranged in furrows 16 inches deep. The seedlings are set out in rows and 16 × 20 inches apart; of every hundred plants set out, 15 to 30 perish and have to be replaced. Flowering begins at the end of May of the same year, but it reaches its maximum only in the third year. During the summer the plants are hoed lightly once or twice. In the second half of May, or if the weather is wet, in June collecting the flowers begins. The buds are paid better. An adult can gather in one day the flowers from 1 500 to 2 500 plants. 100 flowers weigh on average 1 $^3/_4$ oz,; one plant produces 80 to 150 flowers; 100 lbs. of fresh flowers yield 25 to 33 lbs. of dried flowers. In Dalmatia the flowers are dried in the shade in layers 1.2 or 1.6 inches deep spread on cloths stretched on frames. The layers are turned over two or three times a day. The "persian" flowers are first dried in the sun and then in the shade. When the harvest is over the plants are mowed, the ground is hoed in the autumn and again in spring.

The area devoted to this culture in Dalmatia varies very considerably, but it may be set down at 1 700 acres, of which one half is under continuous cultivation. The average yearly production of Dalmatia during the last five years was from 1 500 000 lbs ro 2 205 000 lbs of dry flowers; the yearly production of the Quarnero isles is between 330 000 and 440 000 lbs. The average prices during the last five years: Dalmatian flowers, open, 6 ½*d* per lb., still in the bud 10 $^3/_4$ *d* per lb. Montenegro flowers (wild) 1*d* to 1 $^3/_4$ *d* per lb. dearer than the Dalmatian flowers. "Persian" flowers 1*s* to 1*s* 0 ½*d*. The prices are however subject to great variations; they were for instance 2*d* per lb. in 1883 and 1*s* 8 ½*d* per lb. in 1893.

As for returns, the growing of pyrethrum follows closely that of the vine. It further allows the profitable cultivation of soils which would not be suitable for any other crops. The average time that the plants last is 6 years; some attain even the age of 20.

Accounts of pyrethrum growing on 1 acre.

	£	*s*	*d*
Preparation of the soil, sowing, and setting out . .	47	3	6
Winter and spring hoeing, two summer hoeings, harvesting, carriage and esiccation of the flowers, mowing the stems £ 12 16 *s* 1 *d* per annum for 6 years	76	16	6
Total cost of six crops . . £	124	0	0
Yield: 803 lbs. of dry flowers per acre per year, at an average price of 8.16 *d* per pound . . . £	163	16 *s*	3 *d*

From the difference between outlay and returns, interest on capital and taxes have to be deducted.

The dried flowers are ground to powder at Triest (10 mills), Sebenico, Zara, Ragusa, etc. The principal market of the product is Triest, which sells fully two-thirds of the production of Dalmatia.

373 - *Carludovica palmata* in Brazil.

A palmeira dos chapeus de Chile e Panamá (*Carludovica palmata*). — *Chacaras e Quintaes*, Vol. VII, No. 1, p. 24. Sao Paulo, Brazil, January 15, 1913.

Carludovica palmata is native to Central America, Brazil, Perù and Chile. In Brazil, where it is called "bambonassa", it covers great extents of land; but it is not industrially utilized, The isolaled ribs of young leaves, softened in boiling water, then passed successively into a solution of citric acid and into cold water, after which they are dried, are the material from which the real Panama hats are made. In 1853 and again in 1867 attempts were made to introduce this industry into Brazil; but both failed. The writer insists upon the possibility and on the advantages of another trial.

The province of Moyobamba in Peru is one of the principal centres of the manufacture of Panama hats, which are exported also to Brazil.

374 - Some New Kitchen Garden Plants for 1913.

MARKET GARDENING

GARNIER, MAX. Quelques plantes nouvelles pour 1913. — *Revue Horticole*, Year 85, Nos. 3 and 4, pp. 68-71 and 93-95. Paris, February 1 and 16, 1913.

Early Copenhagen Cabbage. — This vegetable is of Danish origin and superior to most of the early varieties of cabbage in the regularity and size of its large head, which is surrounded by relatively short exterior leaves, few in number. The head keeps for a long time without opening, which is usually not the case with other early cabbages.

Brussels Sprouts, Merveille des Marchés. — An excellent variety and a great improvement on the Demi-nain de la Halle. Grows erect and its height does not exceed 2 feet. The small, almost spherical sprouts are extremely hard and smooth; they grow in large numbers in the axils of the leaves and together form a long compact pyramid.

Dwarf Haricot Bean with variegated seeds. — A true dwarf, very productive and hardy. This bean is classed among the early varieties and is excellent for cooking green as "French beans" The pods are numerous and long, often attaining 8 inches; they are of a bright, light green and contain 7 or 8 beans, which are elongated, half black and half white.

Dwarf Butter Beans, Hundred for One. — These resemble in the shape and colour of their beans the Yellow Hundred for One haricot; this new, half-early variety is to be recommended, as much for its good quality as for its productiveness. The fine, yellow, slightly curved pods are tender, fleshy and of an excellent flavour. This bean is vigorous, strong, and hardy and is equally suitable for field culture and for the amateur's kitchen garden.

Runner Bean without fibres (climbing). — This variety attains a height of over 6ft.; it is strong, full of leaf, light green, and towards the end of the summer, bears fine pods, green when first cut, but deeply tinged with brick red shortly before ripening. The pods are very thick, fleshy and brittle, being entirely without fibres ; they contain 6 to 7 round, pale yellow beans, with a slight brown ring round the hilum.

Red Globe Onion. — This onion is perfectly round, of average size with a very thin collar ; the external envelope is of a fine crimson. The flesh is firm and tinged with pink, the flavour very delicate. It ought to do well in all climates, being fairly early, hardy, easy to grow and keeping well.

Red half-short cylindrical Carrot for forcing. — This vegetable has been especially selected with the view of obtaining a larger crop, while retaining the precocity, light foliage, and qualities necessary in early vegetables. The roots are 2 to 2 ½ inches long and about half this in width. They are absolutely coreless.

Curly Extra Blonde Lettuce. — Somewhat similar to Blonde Géante, but of a more golden colour, the edges of the leaves being more wavy and curled. Its chief advantage is the long time which its very large and firm head lasts. It is very drought-resistant.

Blonde Monstreuse Slow-growing Sorrel. — The result of rigorous selection from the Très Large de Lyon variety, and remarkable for the great size of its very light-coloured leaves ; these are nearly 12 inches long by 8 in. width at the base. This improved sorrel runs up to seed very slowly ; it is extremely productive, and will be unrivalled for market gardens and private garden cultivation.

Invincible Tomato. — A very early, and productive variety with smooth round fruits of a fine red colour.

The plant is of medium height, with light foliage, which does not intercept the sun's rays.

Ruby Tomato. — Fruits spherical of medium size ; skin bright scarlet quite smooth ; very heavy, with very firm flesh. This plant is strong, productive, and has somewhat thickset foliage. Almost as early as the reputed very early varieties, this tomato has the great advantage of a much larger yield.

375 - Artificial Truffle Grounds.

PRADEL, Truffières artificielles. — *La Vie Agricole et Rurale*, Year 2, No. 12, pp. 346-348. Paris, February 1913.

As a check to the deforestation which is taking place everywhere and is accompanied by danger of all kinds, the writer suggests the planting of truffle oaks wherever the nature of the soil permits, and mentions the principal factors which he has found, during thirty years of practical experience, to be necessary for the creation of artificial truffle grounds.

Climate. — A temperate climate is one of the first requisites, and while that of Périgord is particularly favourable to truffle production, still according to Mr. Chatin, there are 53 departments of France in which these fungi are grown.

Altitude and aspect. — A southern aspect is the best, but excellent truffles can be obtained with a northerly one. The best land is moderately hilly and between 100 and 600 m. (300 and 2 000 ft.) above sea-level.

Soil. — Marly soils (socalled oolitic), more or less ferruginous and with a permeable sub-soil are the most suitable. The essentials are that the soil should be light, porous and fairly rich in humus, and that the subsoil should allow the rain-water to drain away. The ideal would be a stratified rock sufficiently compact to hinder the penetration of the taproots of the truffle-bearing tree and at the same time containing enough fissures to permit of the passage of water. This type of rock promotes the development of the spreading roots on which the mycelium grows and bears the truffles.

Where truffles are found growing wild, it is certain that the soil is suitable for their production and the " true black truffle-bearing oak of Périgord " can at once be planted.

Trees. — The hazel, juniper, chestnut, pine, etc., have been mentioned as producing truffles, but the common oak and *Quercus nigra* (1) alone are of any value : only these produce really black highly flavoured truffles (*Tuber melanosporum*).

In order to multiply these suitable trees it is necessary always to sow the acorns in nurseries, for trees raised from seed and not transplanted rarely produce truffles, because they only possess a tap-root, and this grows at the expense of the lateral roots to which the truffle mycelium eventually attaches itself.

Preparation of the Soil. — Ploughing is done in the autumn before planting out, or if the ground is difficult to work holes of 16 inches in each dimension are made. As a general rule, it may be said that close planting hastens the formation of truffle grounds, but they do not last so long. It is therefore recommended to plant in rows 16 to 20 ft. apart, with 6ft. 6 in. between the trees ; this gives about 320 trees per acre. It is well to grow vines between the rows (preferably direct bearers) or sainfoin, etc., as the presence of these plants promotes the development of truffles.

The work necessary before the time of the growth of the fungi, consists of a simple spring ploughing of the plantation ; when the truffles begin to grow, the soil should be worked lightly with a two-pronged hoe in such a manner as not to disturb the truffle bed, which consists of a stratum of hard and compact soil, while the layer above is light and friable (terre de brûlure), having been altered by the action of the mycelium. One acre of uncuiltivated land if converted into a truffle ground gives an annual revenue of £12 to £13.

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(1) Probably *Q. nigra* Thore, = *Q. Toza* Gillet. (*Ed.*)

UIT-GROWING

376 – A New Method of Pruning Young Vines.

VILLEPIGNE, R. Une nouvelle taille des jeunes plants de Vigne. — *La Vie Agricole et Rurale*, Year 2, No. 10, pp. 283-284, fig. Paris, February 8, 1913.

The writer being struck with the gaps which occur annually in the vineyards and the dangers incurred by the year-old rooted grafts usually employed to replace the missing vines, suggests that recourse should be had to rooted grafts which have already been two years in the nursery, treating them as follows:

After the first season in the nursery, they should be cut immediately below the unripened wood (no attention being paid to the fragility of the internodes), and all the buds situated below the upper three or four eyes must be nipped off.

During the second year that the graft is in the nursery, these three buds, or any way two of them, develop and after the second season these two shoots, each pruned to four or five eyes, will give rise to two branches at a suitable height.

The vine is then replanted with all its roots in the vacant hole and its branches are bent and at once tied at the required height. The buds which need care are thus at the same height as the neighbouring branches and cannot escape the notice of the labourer.

These substitutes bear grapes from the first year of planting and the writer has found 80 to 100 per cent. successful; thus he is much pleased with this method, which allows of a vacant space being at once filled, or of a weak vine being removed and replaced by a young productive plant.

M. Villepigue is the owner of substituted vines, and even of whole vineyards, planted in this way and dating from 1907; he declares that the fear of the plants dying from bearing fruit too young is quite unfounded and that the parts of his vineyard which he has thus replanted are the most flourishing and productive.

377 – Research on Grapes Without Pips.

MANARESI ANGELO. Ricerche sulle uve senza semi. — *L'Agricoltura Bolognese*, Year VI, No. 11, pp. 165-168 and Year VII, No. 1, pp. 1-4. Bologna, November 1912 and January 1913.

The development of pipless grapes (with the exception of sultanas and currants only takes place under certain circumstances. When immediately, after flowering, the fertilized ovules of a bunch are involved in a struggle for existence with unfertilized ovules, the possibility of the development of the latter depends almost exclusively on:

a) Primarily, the variety of vine.

b) The nutritive substances. "In a bunch with many fertilized flowers, the unfertilized are so much at a disadvantage in the struggle for obtaining the nutritive substances present, that they fall off without developing, while if the number of fertilized flowers is small, the unfertilized ones persist and produce pipless grapes." (Müller-Thurgau). Nevertheless this statement must not be taken too literally, since in many varieties the bunches always contain a few grapes without pips.

c) Finally, Müller-Thurgau, basing his theory on observations made on pears considers that the stimulus of the growth of the pollen tube may give rise, in the absence of opposing circumstances, to the development of an ovary into a grape without pips.

The number of such pipless fruits on the same vine varies from year to year, as it depends upon unfavourable conditions of pollination and fertilization, which by hindering the formation of grapes containing many pips, leave more nutritive substances at the disposal of the unfertilized flowers which give rise to pipless grapes.

As Müller-Thurgau has shown, in the case of Swiss grapes, the higher content of hydrocarbons and of other organic substances existing in stocks which have been ringed, favours the development of pipless grapes, not at the cost, as a rule, of fruit with pips, but from flowers, which otherwise would have fallen.

The writer thought it useful to repeat these experiments on Italian varieties, observing at the same time the effect of ringing upon the produce. His experiments were made on Trebbiano, Alionza, Bottona, and a variety of Albana popularly known as Albanone. These (with the exception of the first), as well as Chasselas Napoléon, Termarina, Querciola, Lambrusco di Sorbara, Gamay, Cabernet Franc, Moscatello, Uva Passerina of Tuscany, etc., always produce alongside of very large grapes furnished with pips, a larger or smaller number of small pipless grapes, which have the peculiarity of ripening some days earlier than the others and which never attain the same sugar content. The relative number of grapes with and without pips is never constant, and it is noticeable that, in bunches where any of the grapes are pipless, the grapes of both kinds (with and without pips) are relatively large ; the reverse is the case where pipless grapes are few in number, or completely wanting.

Table I gives the data obtained by examining two vines of Albanone (I, II, III) and one of Moscatello (IV).

TABLE I.

Vine	Bunches with many pipless grapes				Bunches with few pipless grapes			
	Normal grapes		Pipless grapes		Normal grapes		Pipless grapes	
	Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.
I	103	1.631	772	0.185	214	1.495	52	0.154
II	173	2.110	170	0.165	264	1.580	1	0.140
III	116	2.647	253	0.324	321	2.349	49	0.306
IV	193	2.093	668	0.217	502	1.878	3	0.367

Experiments on ringing (carried out before the flowering) gave the results shown in Table II:

TABLE II.

Vines		Date of Vintage	Ringed vine		Unringed Vine	
			Number of grapes	Average weight of one grape gr.	Number of grapes	Average weight of one grape gr.
« Alionza »	grapes with pips	17-IX	778	3,224	811	3,091
	» without »	»	880	0,551	0	—
« Bottona »	» with »	»	343	4,073	744	3,242
	» without »	»	191	0,597	35	0,389
«Albanone» I	» with »	21-IX	692	1,968	689	1,969
	» without »	»	179	0,246	39	0,238
» II	» with »	»	207	2,488	548	1,839
	» without »	»	252	0,286	12	0,333
» III	» with »	»	921	1,947	1009	1,460
	» without »	»	63	0,373	87	0,356
« Trebbiano »	» with »	30-IX	1760	2,109	1113	1,803
	» without »	»	0	—	0	—

As is seen, the number of pipless grapes is much larger on the ringed vine (except in the case of Albanone III), which confirms the facts observed by Müller-Thurgau, Sannino, and Tossatti and by the writer himself in 1910. The average weight of the grape, with, or without pips, is also usually greater in the case of ringed vines.

The formation of pipless grapes in the place of normal ones greatly diminishes the production on account of the considerable difference in weight existing between the two. In October 1910, the writer gathered all the bunches (200) produced by three Albanone vines and states that they were divided as follows:

2641 pipless grapes	average weight	0.187 gr.
3240 grapes with pips	» »	2.130 »

The loss of crop is thus very noticeable, all the more as it is a question of young vines which have only just begun bearing.

To prevent this loss, it is necessary to promote pollination, especially cross-pollination, in every possible manner:

a) Growing in the same row varieties in which this phenomenon occurs alternately with others capable of acting as sources of pollen.

b) Artificial pollination is of great assistance in the case of table varieties and especially in greenhouses, but is too costly for cultivation on a large scale.

c) In vineyards, the only possible way of preventing the flowers falling is by repeatedly sulphuring the plants while in flower. According to Pacottet, the agitation of the air produced during this process gives rise to a more intense pollination and this view is confirmed by experiments made by the writer in 1911, as shown in Table III.

TABLE III.

	Ringed vine			Unringed vine		
	Number of bunches	Number of grapes		Number of bunches	Number of grapes	
		with pips	pipless		with pips	pipless
Vine I (not sulphured) .	21	78	1243	19	160	624
» II sulphured . . .	25	219	1616	24	571	210
» III » . . .	13	99	829	26	231	299

The ringing was effected before flowering on the 4th of June; the vines were sulphured on June 21, 23, 25, 27 and 29, and July 2, 4 and 6.

378 - Horticultural Research at Woburn.

PICKERING, S. in *Science Progress*, Nos. 26 and 27, pp. 281-291 and 397-412. London, October 1912 and January 1913.

The Woburn Experimental Fruit Farm was started in 1894 and the results of 17 seasons are now available for discussion. In many cases these are entirely contrary to accepted practice, and in fact experiments which were started with the idea of proving an object lesson in malpractice have forced conclusions in the opposite direction.

I. *Planting*. — Nearly 2 000 trees and bushes have been planted on 20 different soils, and in 8 different counties, with the object of ascertaining the effect of *ramming* the soil while planting, that is to say pounding the soil until it is effectually puddled. An analysis of the results shows that

72 % were favourable to ramming.
17 % " ambiguous.
11 % " unfavourable.

The rammed trees were much more vigorous in every way, and their superiority as measured by increased growth was equal to 50 per cent. on an average. With such a method of planting, some damage must often be done to the roots, and each item of such damage as well as of other supposed bad practice in planting has been the subject of separate experiment. Shortening the roots up to removing one-third of their total length proved beneficial, as also did removing all roots less than 2 mm. in diameter, though loss of vigour has followed the removal of those up to 4 mm. In some cases the roots were bent and even tied in knots, and in others the roots were roughly broken instead of being carefully trimmed, without any detriment to the tree. These somewhat surprising results are quite natural when it is remembered that the life of the tree depends on the formation of new roots and not on the preservation of the old ones, and moreover that the majority of new roots do not even form near the ends of the old ones. In a large number of cases investigated it was found that with apple on paradise stock only 15 per cent. of the new roots were formed within ¼ inch of the old root ends, 15 per cent. started from the stem itself, and 70 per cent. started from other parts of the main roots.

With regard to the proper depth for planting this must vary with the nature of the soil and the habit of the plant, but will generally be within 6 to 12 inches below the level of the soil; small variations of say 4 inches either way have been found to be quite immaterial, as the new roots have no difficulty in making their way to the level at which they flourish best. Trenching preparatory to planting has been tried on five different soils and has been shown to have little effect when measured either by the behaviour of the trees or by the alteration in the water and nitrogen content of the soil. The air supply of the roots was limited in some experiments by sinking an iron drum 18 inches deep and 3 feet in diameter around some apple trees, and covering the top 2 inches with cement. After 4 years the trees were apparently unaffected by this treatment. Since then they have rather fallen behind similar trees which were not enclosed, but this is quite possibly due to exhaustion of the limited amount of soil available for their growth and not to lack of aeration.

II *Pruning.* — The importance of "cutting back" *i. e.* removing half or two-thirds of each branch of a young tree when transplanted, was shown by leaving some young apple trees uncut. Their leaves showed a 25 per cent. deficit in size and little or no new wood was formed; but given that this operation was performed before the period of active growth commenced, it might be delayed till April without detriment. With regard to the annual branch pruning three treatments were tried in various plantations: 1) normal, or the removal of ⅓ of each new shoot; 2) hard, or the removal of ⅔ of each new shoot; 3) no pruning.

The relative sizes were as follows:

	normal	hard pruned	unpruned
Alfter 5 years	100	87	133
» 10 »	100	82	107
» 15 »	100	87	102.5

These results leave no doubt that the less a tree is pruned the larger it becomes. At the same time it was shown that growth as measured by the total production of wood including clippings is least in the hard pruned trees; this deficiency in growth is greater in height and spread than in the girth of the stems. The weight of fruit from unpruned trees was double that from the normally pruned trees and about four times that of the hard pruned, and the increase in crop was not accompanied by a marked reduction in the size of the fruit. Taking an average of 10 years the apples of unpruned trees were 4 per cent. smaller than those of the normally pruned trees, and 18 per cent. smaller than the hard pruned trees.

These results naturally apply only to young trees; with older trees where branch formation is comparatively insignificant, severe pruning caused the production of new wood to be tripled. Having established the principles that the growth of a tree varies inversely with the amount of pruning, it must be borne in mind that the growth of a young tree must also be conditioned so that when it comes into bearing it will carry its crop to greatest advantage, and to this end some pruning will be necessary. Therefore as a general principle it would be advisable to do a certain but decreasing amount of pruning for the first 5 or 6 years after planting, at which time the annual pruning may be reduced to the removal of the few terminal inches of twigs which usually consist of imperfectly ripened wood.

Pruning has been performed in early autumn, in mid-winter including the severest weather, and in spring, without obtaining any appreciable differences, but the results with regard to summer pruning are still somewhat ambiguous. That trees should be pruned to outside buds, also that the cut should be slanting and close to the bud appear to be unimportant details; in fact, with regard to the latter, trees, pruned 2 inches above a bud have always done better than those pruned in the orthodox way, no doubt because the bud is weakened by having the wood cut away so close to it.

With regard to *root pruning*, some trees that were root pruned every 4 years only attained 75 per cent. of the size and 44 per cent. of the produce of the unpruned trees after 15 years; others that were root pruned every two years only attained 35 per cent. of the size and bore an insignificant amount of fruit, and lastly others that were root pruned every year all died before 15 years. Thus, root pruning is shown to be a very severe check on vegetation and should be rarely resorted to, though it may be inevitable in the case of a strong-growing wall tree.

Manuring. — 21 plots each containing 18 dwarf apple trees were divided into three groups: 1) received a normal dressing of manure (12 tons of farmyard manure per acre or its equivalent in artificials); 2) received less than the normal or none; 3) received more than the normal (up to 10 times the artificials and 30 tons of dung).

Even after 17 years, the annual measurement of the leaf size, a triennial measurement of the trees, and the annual records of the value of the crops showed no differences, and the results are the more astonishing as the Woburn soil is not particularly fertile; the layer of good soil is only 7 inches deep and beneath it is a stiff clay subsoil which the roots of the trees penetrate with difficulty. After the first 10 years, one lot of trees was removed, the manurial treatment continued, and farm crops grown, and it was found that with these crops the manures had the ordinary effect which they have on other soils. The experiment with apple trees was also repeated in a very poor sandy soil, and here the effect of manuring was very considerable, showing that the method of experimentation was not in fault.

On the other hand, with bush fruits on the Woburn soil, manures have proved absolutely essential, and dung far superior to artificials except in the case of strawberries.

Measurement of Results. — The total weight of the crop and the average size of the fruit must always be supplemented by data less dependent on seasonal fluctuations; *viz. growth* must be measured. In order to do this when the experiment is a short one, lasting 3 or 4 years, the trees are lifted and weighed. With longer experiments, measurements are made of height, of the spread of the branches, of the girth of the stem or of the length of wood formed during a season, or the relative size of the leaves is determined. The results obtained by these various methods have been compared with each other and with the determinations of dry matter and nitrogen in the leaves. They all show a substantial agreement, though naturally the magnitude of the differences is not the same.

FORESTRY

379 - Australian Mangrove Bark.

COOMBS, F. A. and ALCOCK, F. — *Collegium*, No. 514, p. 62+fig. 1. Frankfurt a. M., Feb. 1, 1913. — (*Abstract from The Leather World*, 1912, p. 850).

The writers discuss the probabilities of a successful starting of a mangrove extract industry in Australia. They mention the difficulties in finding the most suitable places for a centre of such industry, being themselves in favour of Cairn and Cooktown on the Queensland coast. Three different kinds of mangrove bark are distinguished, viz: *Rhizophora mucronata* Lam., *Bruguiera gymnorrhiza* Lam., and *Ceriops Candolleana* Arn. *Rhizophora* is the most important of them, representing fully 75 per cent. of the trees which it would pay to strip; it is characterized by its arched roots above the water growing on the water side of the mud and sand banks, while *Bruguiera* appears to grow best where the banks begin to shelve off to higher and firmer ground. The two are usually known under the name of black mangrove. *Ceriops* is the least common of the three, and does not yield anything like the same amount of bark as *Rhizophora* or *Bruguiera*.

The amount of ross influences considerably the analytical figures obtained, as ross only shews 6 per cent. tannin (average) while the bark contains about 30 per cent. The various mangrove barks have different thicknesses of ross, and *Rhizophora* shews an average percentage of ross of 22.6, *Bruguiera* 37.5 and *Ceriops* 28.8. The analyses of mangrove bark given later are carried out on the bark with the ross on. Barks freed from ross would of course shew distinctly higher figures.

As regards drying of mangrove bark, the writers recommend to collect green bark from the strippers at regular intervals and carry it by boat to a convenient drying centre. 100 lbs. green wet bark yield 66 lbs. (average) of air dry bark of 10.3 per cent. moisture.

It was found that the largest (and oldest) trees carry the stoutest bark with the highest tannin value (see table).

	Rhizophora					*Bruguiera*			*Ceriops*	
Diameter . . . . ins.	4	8	10	12	16	5	9	15	4	10
Tannin %	28.2	30.3	34.0	38.6	40.4	25.8	29.8	36.4	25.8	32.4

The tannin figures (official method) of different barks, calculated on 12.5 per cent. moisture, are given in the next table, where a few figures of Paessler on East-African mangrove barks are added for comparison.

	Rhizophora (21 samples)		*Bruguiera* (8 samples)		*Ceriops* (6 samples)		Paessler's tannin fig.
	% tan	% nontans	% tan	% nontans	% tan	% nontans	
Average	23.1	10.6	29.1	9.0	30.5	11.4	36.5
Maximum	40.4	12.7	30.4	11.8	32.4	15.0	35.8
Minimum	28.2	7.7	23.6	7.0	25.8	7.9	25.8

LIVE STOCK AND BREEDING.

380 - Experimental Researches on Liver-fluke (*Fasciola hepatica* L.).

HYGIENE

RAILLIET, MOUSSU and HENRY. Recherches experimentales sur le développement de la Douve hépatique. — *Comptes Rendus des Séances de l'Académie des Sciences*, No. 1, pp. 95-97. Paris, January 6, 1913.

The writers have made researches on the development of *Fasciola hepatica* L., which have led to results somewhat different from the observations of Messrs. Leuckart and Thomas. The writers introduced into the stomach of a lamb fourteen weeks old, born and reared at Alfort, 18 snails (*Lymnaeus minutus*) which contained rediae; after 52 days, the condition of the animal was as follows:

Flesh flabby, liver somewhat easily disintegrated and injured only on the left side; in the parenchyma of this part of the liver there were canaliculi which contained 10 sexually mature liver-flukes 8 mm. long and 3 mm. broad.

The writers made the same observations in the case of an ox, which was attacked by liver-flukes and had been brought to Alfort, where it was slaughtered 42 days later. Although the development of the parasites was normal, their length was only ⅓ of that of the adult liver flukes. From this fact, the writers conclude that three months are necessary for these parasites to develop within their host and not only six weeks, as was stated by M. Thomas.

As in both cases the flukes were found in the liver parenchyma instead of in the bile ducts, the writers think that the parasites reached the liver from the blood and not by means of the bile-duct. This method of transmission is probable, as the animals which were much attacked by *Fasciola hepatica* suffered from inflammation of the inner membrane of the upper and lower veins of the liver and even of the inferior vena cava. The writers also draw attention to cases in which the liver-fluke has been found in other organs. Messrs. Waldmann and Büchli found these parasites in the liver of sucking calves and M. Frommann even discovered them in the foetus of sheep, in which case the only explanation of their presence was their introduction within the uterus. Experiments made by the writers have shown that the direct entrance of the fluke larvae into the bodies of animals is not possible.

381 – Annual Report of Veterinary Officer Investigating Camel Diseases, for the Year Ending March 31st, 1912.

Lahore, Punjab (India), 1912.

This report deals especially with "Surra" and also mentions the other diseases to which camels are subject.

The occurrence of a thirteenth pair of ribs in camels is spoken of at the conclusion.

382 – A Note on Some Interesting Results Following the Internal Administration of Arsenic in Cancer and Other Diseases of the Foot in Horses.

HOLMES, J. D. E. — *Agricultural Research Institute, Pusa, Bulletin* No. 32. Pusa, 1912.

The writer administered arsenic internally in the control of "Surra" in horses; he found that this remedy had a very satisfactory secondary effect upon four animals, which were suffering from foot cancer, the latter being quickly cured by large doses of arsenic.

383 – Experimental Studies on Contagious Agalactia (Deficiency of Milk) in Goats and Sheep.

MARCA, ROCCO and COCCIANTE, NICOLA. Studi sperimentali sull'Agalassia contagiosa degli ovini e caprini. — *Special reprint from the Giornale della Reale Società Nazionale Veterinaria*, Year LXI. Turin, 1912.

The writers give first a short review of the various works so far published dealing with the contagious agalactia of sheep and goats and then pass on to a detailed account of the disease. The chief symptoms of the latter are fever, alteration of the lacteal glands, joints and eyes of the animals; but, as a rule, the former are alone affected.

The writers were able to produce the malady artificially in healthy sheep by means of sub-cutaneous injections of the blood or milk filtrate taken from diseased animals. Further, they were able to prepare a serum for immunisation against contagious agalactia, which has proved to be very efficient.

384 - The Investigation and Value of Perilla Cake and Mowrah Meal.

FEEDS AND FEEDING

1. — HONCAMP, F., MEICH, M., and ZIMMERMANN, H. Ueber Perillakuchen und Mowramehl. (Mitteilung der landwirtschaftl. Versuchsstation Rostock). — *Die Landwirtschaftlichen Versuchsstationen*, Vol. LXXVIII, Parts V and VI, pp. 321-347 + tables I-IV. Berlin, December 30, 1912.

2. — BREDEMANN, G. Ueber Presskuchen der Perillassat. (Mitteilung der landwirtschaftlichen Versuchsstation Harleshausen, Cassel). — *Id.*, pp. 349-365 + tables V-VI.

As is well known, oil cakes are much in request for feeding cattle owing to their high protein content and to the large amount of fats sometimes present. Lately perilla cakes have again made their appearance on the market; these are made from the perilla plant, a Labiate cultivated in China, India, and sub-tropical Japan for the sake of the oil extracted from its seeds. The production of oil is estimated at 110 000 gals. and is especially imported into Japan where it is used as substitute for linseed oil.

Chemical analysis and feeding experiments on Shropshire lambs gave the following results compared with those obtained with meadow hay:

	Substance		Coefficient of digestibility per cent
	In natural state per cent	Dried per cent	
Water	12.30	—	—
Crude protein	36.31	41.40	87.0
Pure albumen	35.20	40.14	—
Nitrogen-free extract	19.74	22.51	48.7
Crude fats	7.05	8.04	87.7
Crude fibre	16.28	18.56	7.0
Ash	8.32	9.40	—
Dry matter	—	—	56.3
Organic matter	—	—	60.4

From the above are obtained:

	Nutritive substances	
	Crude per cent	Digestible per cent
Crude protein	41.40	36.02
Nitrogen-free extract	22.51	10.96
Crude fats	8.04	[illegible]
Crude fibre	18.56	[illegible]

On the basis of a nutritive value of 90 % per 100 lbs. we have :

	Digestible albumen lbs.	Starch value lbs.
Dry matter	34.76	55.7
Matter in natural state with 12 % of water	30.56	49

Taking the commercial value of digestible albumen in 1911 (Rostock-Mecklenburg) at 1.29*d* per lb., and that of the starch value at 1.20*d* per lb. we have :

49 × 1.20 = ...	4 *s* 10.68 *d*
Supplemented by 30.56 of digestible albumen at 0.168 *d* per lb.	5.13 »
Total . . .	5 *s* 3.81 *d*

It must be noted that the prices quoted in 1911 for concentrateds were very high.

Cakes of *Bassia latifolia* Rxb. ("Mowrah") were found on examination to contain in a dry state and free from fat from 29 to 31 per cent. of saponin ; they are therefore to be regarded as poisonous to domestic animals. In fact, even when diluted to 3.2 : 30 000 and 3.4 : 30 000, they have a haemolytic effect on the blood of the latter. Consequently only after they have been freed from saponin and examined in a laboratory can they be used as food. As for the use of Mowrah cakes as a fertilizer, there were found in a ton :

		s.	*d.*
Nitrogen	57.46 lb. at 6.40 *d*	30	7.8
Phosphorus pentoxide	22.52 » » 1.17 »	2	2.3
Potash	76.42 » » 0.64 »	4	0.9
Lime	6.09 » » 0.05 »	0	0.5
		36	11.5

Considering the form in which the nitrogen occurs and the mass of inert substances, Mowrah cakes used as a fertilizer cannot fetch more than about 30 shillings.

Amongst the species of perilla used for the production of oil and cakes the following should be distinguished : *P. ocymoides* L. the most common, *P. arguta* Benth., especially cultivated in Japan, and *P. nankinensis* Dec., especially grown in India. The anatomical and microscopical characters of the three species are given. The reticulated cells occurring in the external layer of the integument are characteristic ; it is, however, very difficult to distinguish cakes made from *P. ocymoides* from *P. arguta* cakes; but this is practically of no importance.

385 – Tomato Seed Cake.

AGUET, JAMES. Un nuovo prodotto per l'alimentazione del bestiame. — *Società degli agricoltori italiani, Bollettino quindicinale*, Year XVIII, No. 4, pp. 126-127. Rome, February 28, 1912.

A factory at San Giovanni a Teduccio, near Naples, has commenced the industrial manufacture of tomato-seed cake.

The residues from the tomato-preserving factories, as soon as they are collected and before they have time to ferment, are dried in an esiccator and then passed through a series of machines which separate the skins from the seeds ; the latter are then ground and from the meal the oil is extracted by hydraulic pressure. The composition of the resulting cake is the following :

Water	10.10	per cent.
Dry matter	89.90	» »
Crude fat	11.63	» »
Crude protein	38.13	» »
Pure protein	33.44	» »
Digestible protein	23.75	» »

In feeding trials conducted at the Royal Higher School of Agriculture at Portici with Schwyz milch-cows, tomato cake proved to possess the same food value as linseed cake.

386 – Method for the Determination of the Amount of Hulls in Cottonseed Meal.

KOLE, C. J. Methode voor de bepaling van het gehalte aan katoenzaadschillen in Katoenzaadmeel. Rijksproefstation voor zaadcontrole (Afdeling Microscopie der Voedermiddelen). — *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Underzoekingen der Rijkslandbouwproefstations*, No. XII, pp. 34-47 (46-47). The Hague, 1912.

Lately the hull content of cottonseed meal has been determined by washing with water at the Royal Experiment and Control Station at Wageningen, Holland. The method employed is as follows : 5 gr. of the sample are placed in a tall glass and 300 cc. of boiling water is added. The glass is left standing for a least four hours, and then the fluid is poured off, the sediment being turned out onto a piece of muslin 15 × 15 cm., with 100 μ mesh. The four ends of the muslin are gathered up together and the mass is kneaded with the fingers, in order to break it up. The mass is replaced in the glass and water poured on it. When the hulls have sunk to the bottom, the floating parts are decanted off. Then the glass is again filled with water ; when the heavier hulls lie at the bottom of the glass the superincumbent fluid and the smaller hulls and coarse portions of meal are turned out upon the muslin. Then the mass is placed in a mortar and the lumps are pounded with a pestle covered with india rubber. The mass must be washed once more in the glass, and as soon as the hulls have sunk, the floating parts of the meal are poured off. These operations are continued until all the meal is removed. The remainder, consisting of the hulls, is dried and weighed. The content of hulls determined must be multiplied by the factor $^{100}/_{72}$. This factor has been empirically determined.

The limit of the hull content of cottonseed meal is 15 per cent.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

387 - Stock Breeding in Morocco.

GEOFFROY SAINT HILAIRE. L'Élevage au Maroc. — *La Vie Agricole et Rurale*, Year 2, No. 11, pp. 314-318. Paris, February 15, 1913.

There are important breeds of stock in the north-western part of Morocco; but although the natural conditions are favourable to stock-keeping, the number of animals is relatively small. The reasons for this are: the regulations in force forbidding the export of horses and sheep, carelessness in breeding, and want of security. The writer believes that the number of animals bred could be quadrupled.

I. *Horses.* — These are only bred for home use; but though no systematic scheme is followed, certain stallions are often preferred to others. In appearance, the horses differ little from the Berber breed. They often have high hocks, their heads are heavy, and their croup is falling, but the chest and lumbar regions are well developed. The writer fears that the few and carelessly bred animals will not suffice for future needs and therefore recommends the establishment of local studs, the improvement of the horses by crossing them with Arab thorough-breds and the rescinding of the order forbidding export.

II. *Mules.* — These are bred almost entirely in the mountain districts. The price of the Moroccan mule, like that of the Algerian, which it much resembles, has greatly increased of late years, having doubled in three years. This fact will doubtless give an impetus to mule-breeding.

III. *Cattle.* — Cattle-keeping is the most important branch of agricultural industry in North-West Morocco. The animals are pure red in colour and have straight faces and lyre-shaped horns, which bend upwards; the horns are light coloured with black tips; the height at the withers averages just on 4 ft. The Moroccan cattle are distinguished for their fine shape; they are good milkers and fatten well, but are also suitable for work. The daily milk yield is from one and a half to two gallons and the carcass weight of animals of 660 lbs. is 50 per cent. of the live weight.

In the opinion of the writer, the Moroccan cattle could be quickly and easily improved.

IV. *Sheep.* — These are nearly related to the Merino breed. Their special characteristics are: heavy fleece, a large dewlap and folded skin; the folds extend over the neck to the shoulders and often even beneath the chest. The face line, in the case of ewes is straight, but it is curved in rams. The face, as well as the upper parts of the legs, is covered with wool; the latter is fine and regular and is much prized as an article of commerce.

As the export of sheep is forbidden, these animals are only kept by the natives for their milk, skins and wool. The writer recommends their being selected, or crossed with "Mérinos de la Crau", in order to improve their fattening properties.

388 – Canadian National Live Stock Records for the Years 1909, 1910 and 1911.

Ottawa, Canada, 1910, 1911 and 1912.

Amongst other information, this report contains a list of the Canadian Breeders' Associations, together with a short review of their work, information respecting breeds and the number of breeding animals imported into Canada during the years in question (horses imported in 1911 : 2651; of which 1367 were Clydesdales and 540 Percherons), the regulations for the importing of breeding animals into Canada, and a list of the recognized Canadian and foreign herd-books. Lastly, the quarantine regulations for imported animals are also given.

389 – Horse Breeding in Prussia during the Last 25 Years.

HORSES, ASSES AND MULES

VON ÖTTINGEN. Die Pferdezucht Preussens in den letzten 25 Jahren. — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 13, pp. 103-105. Berlin, February 12, 1913.

In 1888, Prussia imported 87 066 horses and exported 11 596 ; in 1912, the imports were 132 007 and the exports 8 038 head. A decrease in the number of imported horses was brought about by the Stud Master in the case of those breeds which could be bred in the country. This especially affected heavy breeds, of which the importation, thanks to the success of local breeding efforts, has decreased of late years. In 1888, 214 local heavy stallions served 14 649 mares of different breeds. In 1912, 798 local Belgian stallions served 46 392 mares (mostly Belgians). At the same time, the keeping of private stallions has been furthered. While in 1888, but few heavy-bred private stallions were kept, in 1912, 1302 of such animals served 65 671 mares.

Little progress has been made in carriage horse breeding. The writer thinks that the only progress which has been made in this direction has been with trotters; although this branch of breeding is still in its infancy and is only indirectly supported by the State, it has nevertheless attained good results.

The most difficult task of the Stud Direction was the promotion of breeding horses for the army. The Prussian army requires 11 400 remounts annually; of these 8 700 are bred in East Prussia. While in 1888, in the provinces which supply these remounts, 1175 local stallions served 65 342 mares, in 1912 the number of the former had risen to 1933 and that of the latter to 115 210. At the same time, the keeping of private stallions was encouraged. The loan of £1433 made to the Breeding Associations in 1888 has since been raised to £8 582.

Further measures for the assistance of breeding army horses are : the establishment of two local studs and the renovation of a third, the formation of three principal studs, the adoption of pedigrees, the selection of stud animals by qualified persons appointed by the State, the granting of prizes to breeders of winners on the race-course, and the raising of the premiums for mares, foals, etc., in the different provinces.

Great success has also been obtained in breeding thorough-breds. This is furthered by the regulations affecting the bookmakers' offices, breeders' prizes, and race-courses.

ATTLE

390 - Feeding Beef Cattle in Alabama.

GRAY, DAN T. AND WARD, W. F. — *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 159, 56 pp. Washington, 1912.

A. — In the first experiment, 60 young steers (2-3 years old) were used. None of them were purebred but all had been graded up by the use of Hereford, Aberdeen-Angus and Shorthorn sires.

The following were the rations given during the fattening time for 84 consecutive days.

Average daily rations for each steer by 28 - day periods.

Period	Lot I: 20 steers			Lot II: 20 steers			Lot III: 20 steers	
	Cotton-seed meal	Cotton-seed hulls	Corn silage	Cotton-seed meal	Cotton-seed hulls	Johnson grass (1) hay	Cotton-seed meal	Cotton-seed hulls
	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs
First 28 days.	4.64	14.88	22.57	4.04	13.58	9.43	4.04	20.53
Second 28 days	6.00	15.27	19.49	6.00	15.11	8.87	6.00	29.43
Third 28 days.	7.73	24.79	—	7.73	14.21	7.03	7.73	23.90

In this experiment, corn silage was used as supplementary feed to the cotton-seed hulls. The average gains in live-weight per day and per steer for the entire period were: Lot I, 1.8 lbs; Lot II, 1.54 lbs; Lot III, 1.71 lbs. Thus Johnson grass proved to be a less satisfactory supplementary feed than corn silage. In Lot I, the steers made the cheapest gains.

B. — Another experiment was made to ascertain whether it paid as well to fatten cattle in the open without any shelter as to fatten them in the cow shed. The cattle used in this test were a mixed lot of 67 animals: steers, heifers and cows. They were divided into two lots. The rations from December 16, 1910 to March 28, 1911 consisted of cotton-seed meal and cottonseed hulls. The amount of food used, the live weight attained, the cost of the fodder and the sale price of the cattle are given in tables.

In Lot I (kept under shelter and provided with straw) the unit of live-weight was obtained at a slightly lower cost then in the case of Lot II, which was fattened entirely without shelter.

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(1) Johnson grass = *Sorghum halepense*. (*Ed.*).

C. — A third experiment, which was carried out according to the same plan for three consecutive years, was undertaken to ascertain whether it is more profitable to extend the summer fattening thoughout the summer (in which case only a small amount of cottonseed cake, from 2.2 lbs. to 4 lbs. per head and per day is used) or to reduce the time by feeding somewhat larger amounts of cottonseed cake (3.24 lbs. to 5 lbs. per head and per day).

The experiments in all cases proved that the latter method was the more remunerative.

391 - The Influence of the Stage of Lactation on the Composition and Properties of Milk.

Eckles, C. H. and Shaw, Roscoe, H.-*U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 155. Washington, 1913.

The milk of 11 similarly fed cows (3 Jerseys, 3 Holstein-Friesians, 3 Shorthorns and 2 Ayrshires) was tested throughout a whole lactation period and its composition determined. The date of calving, the butter production for every 4 weeks, and throughout the whole lactation period, as well as the production of the other components of the milk during the lactation period are given in tables.

The variations in milk yield and in the content of fat, total of proteins, casein and milk sugar are represented by means of diagrams, which also give the relative size of the fat globules in the milk of the cows of the different breeds.

Information is also given regarding the melting point of the milk fat; the refractive index, the Reichert-Meissl number, etc. The appendix contains the total of the results of weekly analyses of the milk of each cow given separately. A shorter account of these investigations is to be found in *Bulletin No.* 156 *of the U. S. A. Bureau of Animal Industry*, where the differences between the different breeds are especially brought forward.

392 - Royal Jersey Agricultural and Horticultural Society.

Annual Report for 1912. *Jersey*, 1913.

This report contains among others the conditions of the admission of cattle to the Jersey Herdbook, the results of the Butter Tests held by the Society in May and October, a list of the prize-winning animals in 1912 and the lists of prizes for 1913, together with a scale of points for cows and bulls.

393 - The Decline of Commoning (1) Flocks of Sheep in South Germany.

SHEEP

Assel, H. Der Rückgang der Gemeindeschäfereien in Süddeutschland. — *Zeitschrift für Schafzucht*, Part 2, pp. 33-37. Hannover, February 1913.

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(1) The sheep of the community graze on undivided communal land (natural meadows) and on the land of the members of the community (arable ground laid down to pasture and meadows). The number of the sheep of each member depends upon the size of his farm. (*Ed.*).

The number of sheep in South Germany has diminished to an extraordinary extent of late years.

This is shown especially clearly by the Bavarian statistics: according to the latter, the number of sheep in Bavaria was:

In 1892	968 414
» 1897	905 916
» 1900	760 428
» 1904	680 099
» 1910	638 321

In June 1907, the sheep on the different farms were divided as follows:

Large farms of over 250 acres	27 599	head
Average and small farms	743 046	»

The continual subdividing of the communal property, chiefly at the request of the small peasant proprietors, and the consequent sacrifice of the common flocks, have led to the general decline of the stock of sheep in South Germany. This result has also been furthered by the more intensive cultivation of the land, over-sea competition, limitation of the market by unfavourable commercial treaties, as well as want of experienced shepherds.

The writer suggests as means of promoting sheep-breeding: more intensive feeding (clover pastures) the reestablishment of courses of instruction for the shepherds, and the retaining of the common grazing lands wherever these are suitable for sheep-breeding.

394 - The Apulian Merino Sheep.

JOSA, G. La pecora merina pugliese. — *Estratto dall'Almanacco dell'Italia agricola, Giornale di Agricoltura per l'anno 1913*, pp. 15 + fig. Piacenza, 1913.

Flocks of Merino sheep were imported into Apulia from Spain, probably from the time of Alfonso I of Aragon; by Murat; and repeatedly by the Bourbons of Naples. The Apulian Merino sheep of today is descended from the flock of the Royal farm "dei tre Santi", which contained in 1860 over 120 000 head and, after the fall of the Bourbons, was sold to some of the large Apulian breeders. These sheep are found on almost the whole of the plains of the Capitanata, *i. e.* the Tavoliere. They are of medium height and their wool is short and fine; they also give meat and milk. The flocks are kept on the nomad system; they graze the Apulian winter pastures from the end of October to the end of May, and the summer pastures of the Abruzzo and Molise mountains for four months. The adult animals obtain all their food from grazing: 16 head to 10 acres in Apulia, and 12 in the mountains. The lambs, during and after weaning, are run on barley or vetches. There are few or no shelters.

Wool.

Average weight of washed fleece *

Lamb 5 months old	2 1/4 lbs.	Teg 1-2 years old	5 3/4 lbs.
Ewe	4 to 5 »	Ram	7 3/4 »

Maximum length of wool of fleece:

Absolute: 4 ½ in. (lambs) to in. (selected rams)

Relative 3 ½ in. (4 year-old ewes) to 5 ½ in. (selected rams)

Number of curls . . . . 15 to 17 per inch.

Medium diameter of fibres . . . . 0,0008 to 0,0010 inch.

* In this operation, the wool loses from 25 to 33 per cent. in weight

Meat.

Average live weight:

Lamb ("vernareccio")	born in November	: at birth 8 3/4 lbs.	: 5 months old,	75 lbs.
» ("cordesco")	» » February	: » » 8 lbs.	: 45 days »	30 »
» ("mulacchio")	» » March	: » » 8 »	: 30 » »	24 »

Yearling ram	100 lbs.	Ewe teg	60 lbs.
2-year-old ram	130 »	2-year-old ewe	75 »
Ram (from 3 to 6 years old)	160 »	Ewe (from 3 to 6 years old)	90 »
Wether	175 »		

Milk.

Production per ewe per day, 1/2 to 3/4 pint.

Production per ewe per annum 12 to 16 gall.

Composition of milk: S. G. 1.0375; fat 7.55; total solids, 19.22 per cent.

The profits are most variable, depending chiefly upon the season. The writer kept an account of the expenses for two successive years: with a capital of £10 587 (2 700 sheep at about 18s each; 1 220 acres of pasture; buildings; circulating capital; live stock; utensils and apparatus for cheese-making) and with £1 249 for expenses (£527 for interest on capital and £722 for the staff, mountain pasturage, etc.), there was in 1909-1910 a gross return of £1 626 and a net return of £ 373; in 1910-11 the gross returns were £ 1 427 and the net returns £ 178.

Thus, the expenses sometimes reach 95 per cent. of the gross returns; at other times the yield may be regarded as satisfactory.

It has been recommended in order to improve the condition of the industry, that the Apulian merinos should be crossed with the Rambouillet breed to obtain early maturity and more mutton. But the hybrid is less hardy and apparently produces less milk. The writer therefore prefers the selection of the present type and counsels improvements in the rearing system (better shelters, less fatigue).

395 - The Merino Sheep of North Africa.

Couture, M. Le Mouton Mérinos dans l'Afrique du Nord. — *La Vie Agricole et Rurale*, Year 2, No. 7, pp. 207-211. Paris, January 18, 1913.

The writer estimates the number of sheep in North Africa at about 10 million head. Unfortunately bad management, occasional scarcity of food, entire ignorance of the principles of breeding and other similar causes have prevented sheep-keeping becoming a success. The flocks are very unequal and the results of sheep-keeping are of small value. The extensive and excellent grazing land would permit of an increase in the number of flocks. The writer is of opinion that the mutton production could easily be doubled and the wool production quadrupled, if the following measures were adopted: regulation of the water-supply (arrangements for damming back the water, multiplication of watering places), turfing the ground, making sheds for shelter in bad weather, cultivating cereals or pulse, careful selection of animals used for breeding. The writer considers that of the three breeds of sheep in North Africa (the fat-tailed, Berber, and Arab breeds) the latter, which he believes to be the original of the Merino, could easily be improved. This sheep has a white face ; its wool is good, fine, and much prized. The Arab sheep is a good wool-producer and possesses in a latent form all the advantages of the present Merino breed; these latent characteristics would be brought out and increased by mating selected ewes with Merino rams. For this purpose the writer recommends the Rambouillet breed.

POULTRY

396 - A New Method for the Industrial Preservation of Eggs.

DE KEGHEL. Conservation industrielle des œufs. — *Revue de Chimie Industrielle*, Year 24, No. 277, pp. 12-18. Paris, January, 1913.

After rapidly touching upon the subject of the consumption of eggs and the different ways in which eggs are used in industry and as articles of diet, the writer gives a summary of the various processes employed for preserving them. As far as his experimental experience goes, the writer prefers methods based on the use of animal or vegetable fat, and especially those where the eggs are embedded in soft fat in such a way as to exclude all passage of substances from outside. Before the eggs are coated with fat, they should be sterilized with a 0.2 per cent. solution of fluoride of silver. The material for coating is compounded according to the following formula :

Earthnut oil	14	gr.
Palm oil	20	»
Coconut oil	16	»
Prepared lard	47	»
Spermaceti	2	»
Trioxymethylene	1	»
Powdered thymol	0.05	»

This mixture prepared over a slow fire acquires, when cold, the consistency of vaseline and is as easy to manipulate. Eggs preserved in this way had the same appearance and taste after 18 months as so-called "new-laid eggs". This system is adopted at a small factory near Ghent, where about 26 000 000 eggs were preserved last year, the work all being done by hand and almost entirely by women The cost price of sufficient mixture to coat 100 eggs is not more than 6*d*, and the preserving cost does not exceed 1s 8*d* per 100.

397 - The Poultry Tick.

LAURIE, D. F. *Department of Agriculture of South Australia, Bulletin No. 74.* Adelaide, 1912.

The poultry tick (*Argas persicus*, super family *Ixodoidea*, family *Argasidae*) was, according to the writer, introduced into South Australia from India and does much harm in the former country, being the means of transmitting *Spirochaeta Marchouxi* (the causative agent of tick fever). Good results against tick fever have been obtained with salvarsan, but the only radical cure, in the opinion of the writer, is the eradication of the tick. To this end Mr. Laurie has tried various measures and he finds that a 5 or 10 per cent. kerosene emulsion is the best remedy. The ticks are destroyed by one minute's immersion in this liquid; for practical purposes, the spraying, and even soaking, of poultry houses with this emulsion has proved efficacious. Old timber containing many cracks, which serve as shelters to the ticks, should not be used for poultry houses.

The paper deals at length with the life-history of the insect and is illustrated with many good plates. It also gives the regulations in force in South Australia regarding the diseases of poultry.

398 - Sacbrood, a Disease of Bees.

BEES

WHITE, G. F. in *U. S. Department of Agriculture, Bureau of Entomology, Circular No 169.* Washington, 1913.

The writer refers to the works of Howard, Maassen, Burri and Kürsteiner on brood diseases of bees. The last-named investigators found diseased brood free from bacteria in Switzerland. This disease was carefully studied by the writer, who gave it the name of " Sacbrood ". Brown is the most characteristic colour assumed by the infected larva during its decay. Various shades are observed; the term " gray " might sometimes be used to describe the colour. The form of larvae which have succumbed to this disease changes much less than it does in foul brood, and the body wall is, as a rule, not easily broken; thus often the entire larva can by removed intact from the cell. The content of this sack-like larva is more or less watery; the head end is usually turned markedly upwards. There is practically no odour from the brood combs.

In the investigations of the disease, dead and infected larvae were picked from the combs, crushed, and mixed with sterile water. This suspension was filtered in a Berkefeld filter. The filtrate was fed in syrup to six healthy colonies and sacbrood with typical symptoms was produced in all the colonies thus fed. Filtrate from the brood of one of the artificially infected colonies, when fed to two healthy ones, produced sacbrood in each. Other experiments made indicate that the virus is killed by the application of a comparatively small amount of heat. The writer intends publishing a detailed account of his investigations.

FISH

399 - Tape-Worm Disease of Roach and Bream.

WUNDSCH. Die Bandwurmkrankheit der Ploizen und Bleie im Müggelsee, ihre Ausbreitung durch den herbstlichen Vogelzug und ihre Bekämpfung. — *Mitteilungen des Fischerei Vereins für die Provinz Brandenburg*, Vol. II. (New Series), No. 12, pp. 178-183. Berlin, March 1913.

An investigation of the waterfowl which frequent the Müggelsee near Berlin has shown that the strap tape-worm (*Ligula simplicissima*), which is found sexually immature in roach and bream, occurs in large numbers, and with fully developed reproductive organs, in the alimentary canals of Common Gulls (*Larus canus*), Black-headed Gulls (*L. ridibundus*), Goosanders (*Mergus merganser*) and Red-breasted Mergansers (*Mergus serrator*).

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

400 - Comparison of Sources of Mechanical Power in Agriculture (1).

SCHWANECKE, H. K. Vergleich mechanischer Betriebskraft im Landwirtschaftsbetrieb. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 3, pp. 95-108. Stuttgart, February 1, 1913.

This paper compares, with the help of diagrams, the most important power machines used in farming, as regards the cost of installing and working them, the space, upkeep and assistance they require, as well as their safety and readiness for use.

The total cost of installation of power machines increases naturally with their size, while at the same time the cost of installation per H. P. diminishes; but the different machines vary considerably in this respect. These differences are shown in the annexed diagrams (figs. 1 and 2). (2)

It will be seen that electric motors require the least cost of installation, next follow combustion motors, then steam engines and lastly wind motors. Within these main lines there are smaller variations which are also clearly shown by the diagrams.

The working expenses include generally interest and amortizement of installation capital, repairs and upkeep of the plant, fuel, lubricants, etc., and wages of engine men. To these must be added smaller sums for the insurance of the plant and attendants, etc. The interest and amortizement are in the main constant annual expenses, and nearly the same whether the machine works much or little, while the other expenses depend mostly upon the greater or less use of the plant. In figs. 3 and 4 the curves show the working expenses for 300 and for 600 hours' work per annum.

As regards the amount of space required, the writer gives the following data: Electric motors require the least space, combustion motors follow, after which steam engines fixed and portable, gas motors and last of all the improved steam engines. Wind motors do not as a rule require much space, and local conditions decide as to the advantage of using them.

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(1) See No. 829, *B.* May 1912. (*Ed.*).

(2) The Mark is about 0.98 of a shilling; taking it as shilling, each division in fig. 1 represents £100 and in fig. 2 £10. In fig. 3, each division (4 Pf.) represents very nearly one halfpenny. (*Ed.*).

The smallest demands as to upkeep and attendance are made by electric and wind motors. Combustion motors follow, after which come gas motors and then steam engines.

The greatest safety in working and the greatest durability are afforded by electric motors and in general also by wind motors. Somewhat less favourable are the combustion and gas motors, and least of all the steam engines.

Also as regards the ease and rapidity with which they may be set going, electric motors occupy the first place, followed, in decreasing order of merit, by combustion motors, gas motors and steam engines.

Finally, the writer observes that the choice of the power machine depends very much upon local conditions and that consequently no particular group of motors may be considered absolutely superior to the others.

401 - A New Dynamometer for Steam Ploughs.

REZEK, J. Ueber ein neues Dampfpflug-Dynamometer. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur*, Vol. 1, Part 3, pp. 393-406. Vienna, January 15, 1913.

The writer draws attention first to the great difficulties which attend the technical investigations on the double engine system of ploughing, in determining the indicated power and that effectively transmitted from the engine to the plough, and then to the unreliable character of the instruments and methods hitherto employed for this object.

After an exhaustive review of the existing dynamometers, the writer describes the solid and durable apparatus he has invented (figs. 1 and 2) and its perfect and reliable working.

This belongs to the group of cylinder and piston instruments. Its cylinder, filled with glycerine, is connected with the draught hook of the plough and the piston with the cable of the working engine. The pressure exerted on the liquid is registered by an indicator, shown in the drawing, on a strip of paper fastened to a drum which is caused to revolve in the same direction by a belt from the axle of the bearing wheels.

This cylinder and piston instrument has the advantage over spring dynamometers in having a rigid non-elastic connection between the motor and the working implement, thus in no way altering the manifestations of the work to be examined. It can besides be built of the necessary dimensions to ensure the required solidity and durability of the instrument, which is not possible with Prof. Giordano's box dynamometer (1), the principle of which requires the sides to be as thin as possible. A further advantage of all cylinder and piston instruments lies in the possibility of using with them steam engine indicators.

While in box dynamometers the deformation of the box is constant, in cylinder and piston instruments there is a cause of error in the friction

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(1) See: GIORDANO FEDERIGO. *Le ricerche sperimentali di meccanica agraria*, p. 132. Milano, 1906. (*Author's note*).

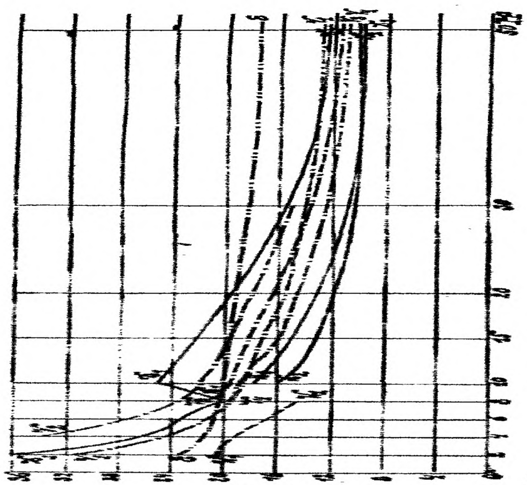


Fig. 3.
Working expenses per H.P./hour in Pfennige.
600 hours.

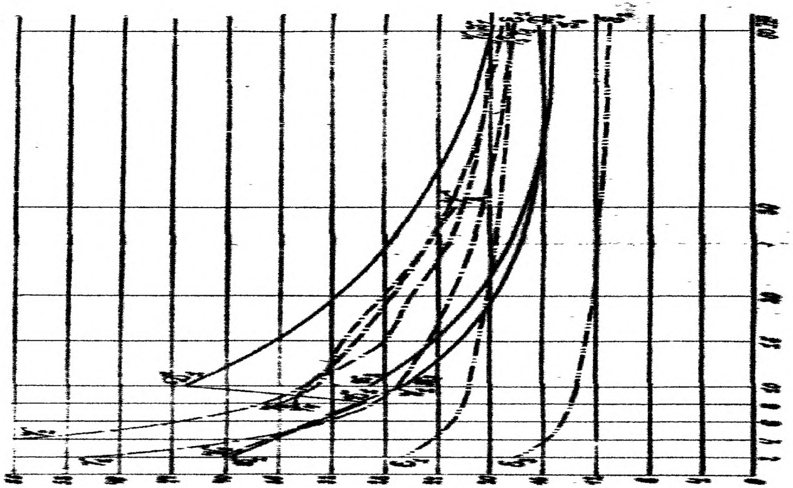


Fig. 4.
Working expenses per H.P./hour in Pfennige.
300 hours.

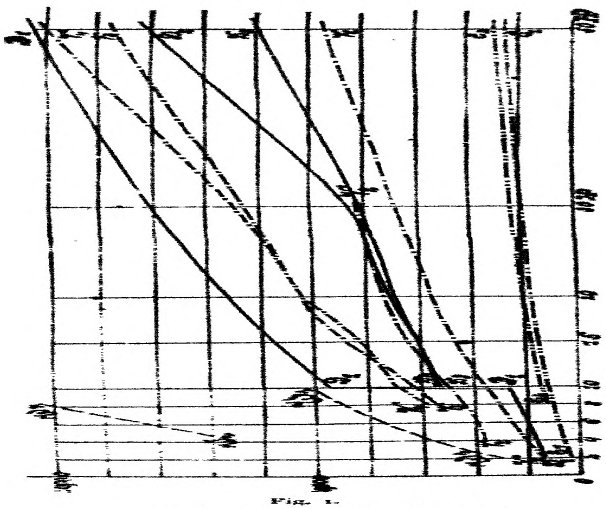


Fig. 1.
Total cost of plant in Marks.

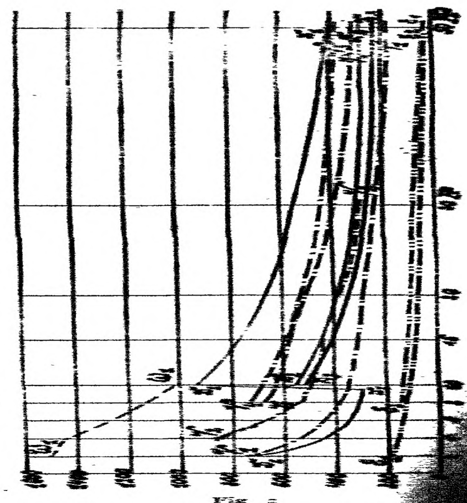


Fig. 2.
Cost o plant per H.P. in Marks.

D_1 = Steam plant I (common).
D_2 = Portable steam engine II.
E = Electromotors.
V_1 = Combustion engines I (stationary).
V_2 = " " II (portable).
V_3 = " " III (crude oil engines).
V_4 = " " IV (gas motors).
W_1 = [illegible] I (simple).
W_2 = " II (double).

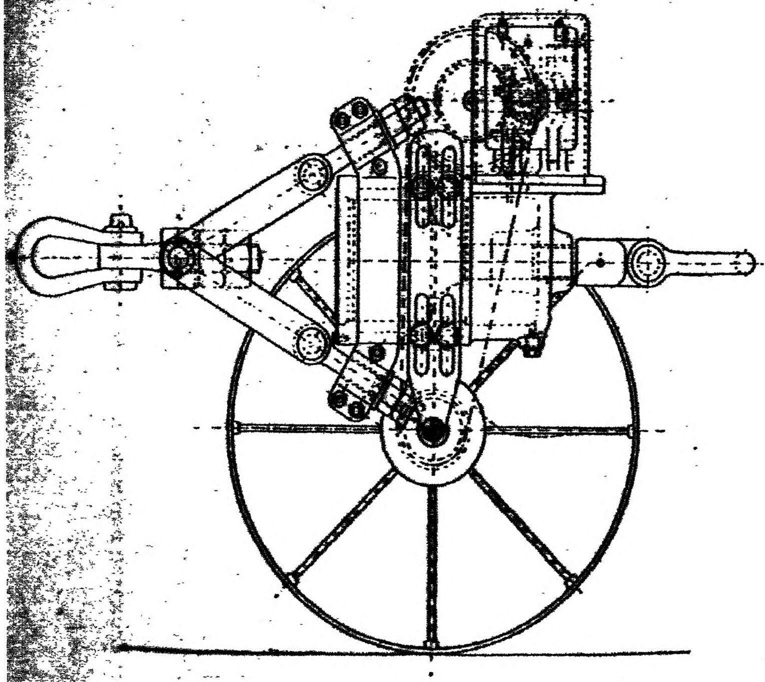


Fig. 1

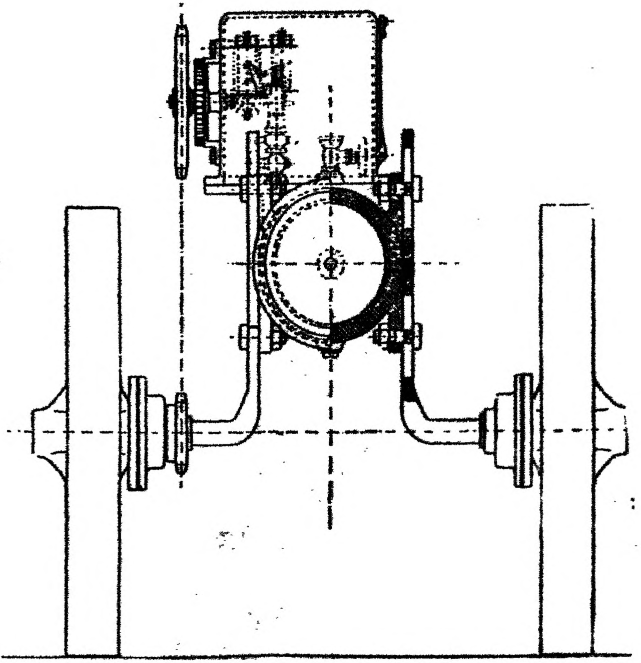


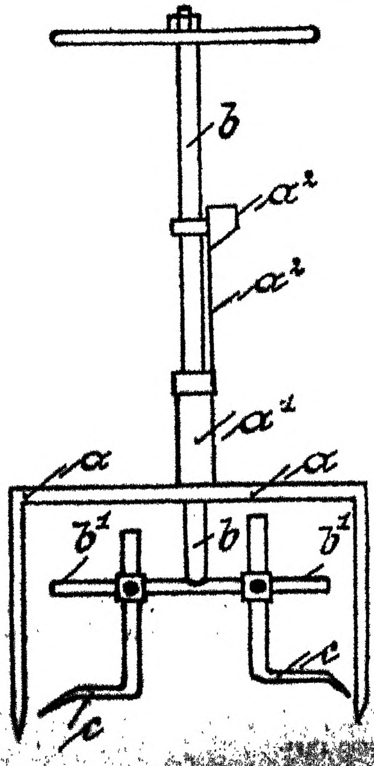
Fig. 2

of the piston in the cylinder, and this has been avoided by the writer in his apparatus by the use of a frictionless piston so arranged as to revolve in the cylinder. A special device to cause it to revolve is not necessary when the dynamometer is used in investigations of steam hauled ploughs, provided it be so situated between the plough and the engine that the cable is connected with the piston instead of with the cylinder. When this condition is fulfilled, the cable, owing to the twist it gets in the making, gives the piston a rotary motion in the cylinder, which begins immediately the cable is taut and continues regularly in the same direction for the whole length of the furrow. The piston moves in the cylinder almost uniformly according to a helicoid line, the pitch of which, though amounting only to a very small fraction of a millimeter, is strictly proportional to the changes in the resistance to traction, because the constant rotary motion of the piston prevents any friction arising.

402 – **Hand Hoe for Beets.**

Handhacken zur Rüben-Kultur. — *Blätter für Zuckerrübenbau*, Year XX, No. 3, pp. 43-44. Berlin, February 15, 1913.

By means of the hoe shown in the annexed figure it is possible to work the soil in a circle all round a beet without damaging it. The implement



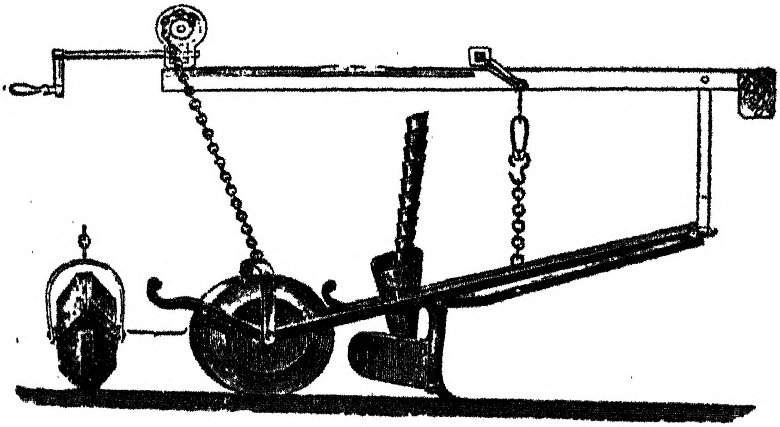
consists of two blades (*c*, *c*) fixed at variable distances on the horizontal arms (b^1 b^1) of the vertical handle (*b*), which goes through a socket (a^1) of the fork (*a*). The socket is provided with a rod (a^2) which is used to drive the fork into the ground. By shifting the position of the blades plants differing in shape, size and distance apart may be conveniently hoed.

When the tool is placed over a plant and the cross- handle is turned, the blades, pointing in or out according as they have been set, loosen the ground in a circle all round.

403 - The Pracner Drill.

VOGLINO, E. Il metodo Demtschinsky si può applicare anche ai cereali di primavera. — *Il Coltivatore*, Year 59, No. 3, pp. 73-79 + 5 figs. Casalmonferrato, January 30, 1913.

The writer, in discussing the Demtschinsky method (1) modified by Zehetmayr for the cultivation of wheat and of other cereals, mentions a new drill suitable for opening the small furrows in which the seed is to remain covered by a layer of slightly compressed earth as is required by the above method. This drill, invented by Zehetmayr, is built by Pracner of Raudniz on Elbe (Austria), after whom it is named.



The writer has seen this drill at work in Apulia in the estate of S. Vito dei Normanni belonging to Prince L. di Frasso-Dentice, who used it also in his estates in Moravia and suggested to the maker some improvements, especially regarding the distance between the furrows, which he wants to be eight inches and upwards so as to allow of horse-hoeing.

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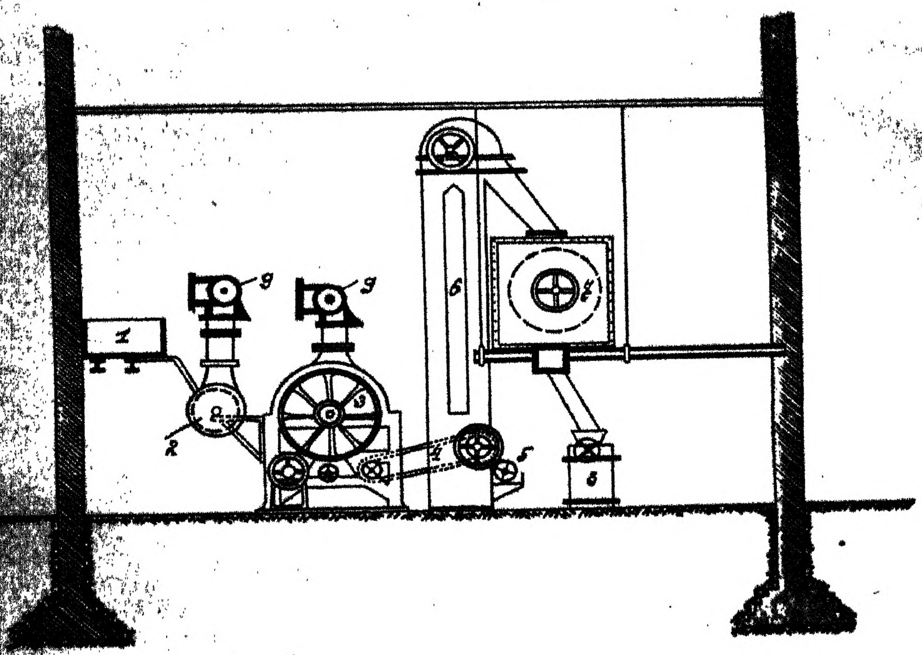
(1) See No. 1708, *B.* June 1911. (*Ed.*).



The writer says that the drill in question is an ingeniously contrived and practical machine which resolves very well the problem of sowing in furrows. A small share is attached directly to the seed distributing tube (see fig.) and is followed by a wheel-shaped roller, which, besides compressing the earth about the seeds, which is so useful in dry soils, assists in giving the furrows a proper shape, thus rendering them less liable to be damaged by the rain and bad weather.

With these drills sowing as with the usual drills can be carried out provided they be fitted with the usual coulters.

404 - The Present State of Milk-Drying Technique.

FREUND, EMIL. Der heutige Stand der Milchtrocknungstechnik. — *Monatshefte für Landwirtschaft*, Year 6, Part 1, pp. 16-29. Vienna, January, 1913.

Under the name "Milk-powder" the writer designates the powdery product into which whole or skimmed milk can be transformed. It contains only 12 to 14 per cent. of water; otherwise its chemical composition and taste are the same as those of milk. It appears to dissolve in water without leaving any residue and the solution possesses all the characters of fresh milk.

A great proportion of the methods known for the preparation of milk powder have found but little practical application ; such, for instance, are the processes of the Rhine Food Industry company, Berlin, of the chemical Works "Rhenania" of Aix-la-Chapelle, of Dr. Knoch, Stuttgart, Küpfer and Werthmüller, of John Camrick of New York and Robert Ellin, Vonkers (U. S. A), of the soup tabloid manufacturers, I. Maggi, etc. Dr. Eckenberg's patented process raised much interest but has not been adopted to any great extent.

The process according to Just Hatmaker's patent is widely spread in America and in France, Germany and neighbouring countries

Dr. Knoch has observed in milk powders made by this method that the albumen loses the power of dissolving and that the fat separates on the surface of the liquid.

A process that has recently appeared is that of the Dry Milk Central Works (Trockenmilchzentrale) Oskar Nicolai, Virsen, Rhineland. The mode of proceeding is the following: Well filtered milk is reduced in a suitable evaporator to a certain volume, after which it passes to the milk drying machine, which in the main consists of a small distributing roller and a large steam-heated drum ; by means of a scraper-like device the white sheet of milk as thick as paper is detached from the drum and laid on a carrier which conveys it to a screw which breaks up the sheet and carries it to an elevator, whence another screw delivers it to an automatic drying apparatus. On leaving this it goes through a screening machine fitted with brushes and sieves from which it issues ready for packing and for sale.

A milk drying plant on this system is shown in the annexed figure, in which : 1, is the milk tank ; 2, preliminary evaporator ; 3, drying drum ;

4, carrier ; 5, transport screw ; 6, elevator ; 7, drying apparatus; 8, screening machine ; 9, ventilators.

Similar to Nicolai's process is Gabler Saliter's. The drying, however, is not performed by a current of air but in a vacuum apparatus.

Lastly the Trufood process is to be mentioned ; according to this the milk is first concentrated in vacuo and then submitted to the pulverising process.

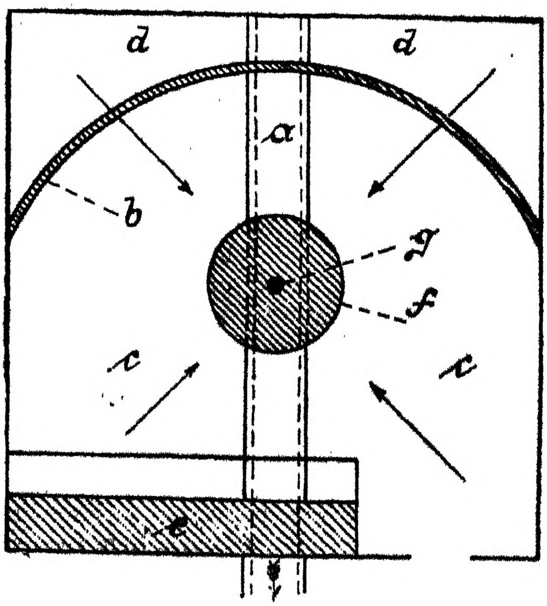
From the above it appears that quite a number of methods for the preparation of milk powder are known. Whether these yield a product which may be pronounced perfect from every point of view is an open question. Anyhow some of the processes produce fairly satisfactory milk powders.

NSTRUCTION

405 - A Practical Flooring for Pig Styes.

LEISI-GISLER, H. Ein praktischer Schweinestallboden. — *Schweizerische Landwirtschaftliche Zeitschrift*, Year XLI, Part 6, pp. 131-132. Zürich, February 7, 1913.

The basin-shaped floor shown in the annexed figure is 9 ft. 9 in. square with a fall in the centre of about 5 inches. A covered drain (*a*) crosses it throughout its length. An aproximately semicircular concrete or brick rim (*b*) 4 inches wide and 6 in. high, divides the floor into the part for the litter (*c*) and the part for the droppings (*d*). It has been observed that pigs prefer leaving their droppings along the wall furthest from the trough (*e*) where the floor is somewhat higher. This fact has been considered in the arrangements of the present floor . The urine follows the outside of the



rim and falls into the drain without wetting the straw. Another advantage is that the straw, through the movement of the pigs, tends to collect in the lowest part just where the animals like to lie; consequently they always rest on the straw instead of on the bare floor.

For brood sows a wooden disk about 28 inches in diameter (*f*) is fastened to a post (*g*) reaching down from the roof to 12 inches above the lowest part of the floor. Under this disk the suckling pigs can crawl and avoid being crushed by their mother.

RURAL ECONOMICS.

406 - The Limit Value of the Means of Agricultural Production as Basis for the Calculation of the Economical Limit of Outlay.

RURAL ECONOMICS

SCHÖNFELD, LEO. Der Grenzwert der landwirtschaftlichen Productionsmittel als Grundlage für die Berechnung der ökonomischen Intensitätsgrenze des Aufwandes. — *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 411-441. Vienna, January 15, 1913.

The different portions of the means of production employed have not the same value for agricultural production, for each of them, though they are equal among themselves, is utilized to a different degree. After having reached an optimum production the gross returns, and consequently the utilization and the net returns, for the same additional outlay begin to diminish, and production at last reaches a point at which the total gross returns do not increase any more by any further addition of outlay. The difference in the utilization of the portions of outlay follows the well-known law of diminishing returns of agricultural production, which is determined by three facts:

1. The production of plants on a given area is limited by the following factors which are limited to the unity of surface: space, light and air, warmth and rainfall; animal production in its turn is limited by the physical dimensions and specific productivity of the organisms.

2. According to Aereboe the character of being present in the minimal proportion may belong at any moment to any one of the factors; for the better or worse utilization of an outlay the frequent favourable coincidence of all the necessary factors of production is decisive. The number of moments however in which plants are in a position to utilize completely a considerable capital of plant food in the soil must be all the smaller the higher this capital is, the more the requirements of plants vary as to the amount and quality of their plant-food during their period of growth and the shorter the latter is.

3. The first portions of the outlay serve to build up and to maintain the substratum of production in the organism of the plant or of the animal and only the subsequent portions of outlay are utilized for transformation into the principal products.

The writer gives a graph of the relationship between the quantities of means of production employed, the limit gross returns, and the total gross returns. The "limit gross return" of the total outlay is the increase of the gross return obtained by the addition of the last portion of outlay. It is to be distinguished from the real gross returns obtained by the single portions of the outlay: while the "limit gross return" in general varies for every portion of the outlay, the real gross returns, or the average gross returns or the portions of general gross returns corresponding to each portion of any outlay, are equal to each other. The "limit gross returns" are used when it is a question of expending or not expending the last portion of an outlay; while the average gross returns serve for the calculation of average utilizations and the like. The writer then gives a mathematical formula showing the relation between the two values, and demonstrates further that the total gross returns may be expressed either as a product of the average gross returns by the number of portions of the outlay, or as the sum of the limit gross returns.

After having introduced the notion of "limit gross returns in cash", he arrives, with the help of integral and differential calculus and on the basis of limit gross returns, to a mathematical expression for the total cash gross returns for a given outlay. He thus shows that the gross returns may be considered as a function of the outlay.

Under "utilization value" (Gebrauchswert) of a means of production, only the cash net returns value is to be understood. This is obtained by subtracting from the increase of the cash gross returns the cost of the greater quantity of means of production used or of the further increased costs of production. It is an error to designate the utilization or the cash gross returns as the "utilization value" of a means of production, as high gross returns and a higher utilization lead to a utilization value of the means of production only when there are net returns. These however depend to a great extent upon the cost of producing the means of production.

Nor can any money value determined indirectly for any non-marketable means of production be called utilization value. From the above it appears that the cash net returns value of a certain quantity of means of production may be directly calculated with correctness by a variation experiment only when the variation is possible without alteration of the other factors which take part in the production. The correct calculation of the cash net returns value of such quantities of means of production, without which there cannot be any production, for instance the total quantity of meadow hay supplied as principal food, is theoretically quite out of the question, as in this case every experiment of variation on the total quantity is impossible. In order to ascertain the limit of intensity only the cash net returns value of those portions which are near the supposed limit of intensity need be calculated. The writer then explains the notion of the "limit cash net returns value" (grenz-geldreinertragswertes), or briefly "limit value", which represents the increase of the cash net returns obtained by the last portion of the outlay, and he calculates this also on the basis of the "limit gross returns."

The limit of intensity can be rigorously established in figures only for means of production the cost of producing which is known. This is not the case with those unmarketable means of production used as the basis of production. With concentrated foods and chemical manures the precise limit of intensity stated in figures plays an important part. The use of a means of production for agricultural produce has reached the economical limit of intensity when it attains that point at which the cash net returns are at a maximum. In order that this should be the case all those portions which still have a positive limit value must have been employed; at the limit of intensity there is the one whose limit value = 0. When therefore it can be ascertained at what stage of the outlay this portion is situated, the limit of intensity will be given. This stage of the outlay is then calculated by the writer by means of the cash gross returns and cash net returns values of the portions of outlay, and in this way he finds a formula for the exact calculation of the economical limit of intensity of the outlay.

Lastly, he determines by means of an experiment of Schneidewind on manuring sugar beets with nitrate of soda, and one of Kellner on milk yields as affected by increasing quantities of fodder, the limits of intensity of the outlay on manures and on concentrated foods respectively, as they result from these variation experiments.

407 - **The Profitableness of Hoed Crops.**

SAGAWE, B. Die Rentabilität des Hackfruchtbaues. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 4, pp. 113-128. Stuttgart, February 15, 1913.

The writer endeavours to show in this paper that it is possible by means of the inductive statistical method to find the most suitable organization and degree of intensity for the most varied conditions. In order to calculate the intensity of labour in the farm he values the percentage of the acreage devoted to meadows and forage plants at ½, that taken up by grain crops at 1, and that occupied by hoed crops, which are the most exacting, at 3. In this manner he obtains a figure which represents the intensity of cultivation (Anbau-intesitäts-zahl) characterizing a farm (1). He calculated this index number for all the farms he examined, then he arranged the farms according to these indices and observed the results of the farms in connexion with this order. The material for this work was taken from the book-keeping records of the German Agricultural Association (Deutsche Landwirtschaftsgesellschaft) and the Book-keeping Bureau of the chamber of Agriculture of the Province of Silesia. Only those farms were considered in which conditions allowed of a reduction or increase of the area devoted to hoed crops.

A superficial observation of the farms arranged according to the above index shows what far-reaching differences are caused by altered intensity of cultivation (see Table I).

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(1) If for instance 25 per cent. of the total acreage is devoted to meadow and forage crops, 25 per cent. to grain and 50 per cent. to hoed crops, the index number of the intensity of cultivation will be 25 × ½ + 25 × 1 + 50 × 3 = 187.5.

TABLE I.

Number of farms	Index of intensity of cultivation	Total value per acre			Net returns per acre			Gross returns per acre			Interest per cent	Gross returns in percent of value	Net returns in per cent of gross returns
		£	*s*	*d*	£	*s*	*d*	£	*s*	*d*			
Extensive 40	103	28	3	5		15	7	4	3	4	2.76	14.8	18.7
Medium 37	122	28	19	3	1	7	1	5	7	6	4.65	18.5	25.2
Intensive 40.	141	34	6	5	1	13	9	6	10	11	4.91	19.1	25.8

According to the above, the greater economical utility of hoed crops over forage crops in regions in which arable land predominates can hardly be doubted, for with extensive farming (much land under forage crops and meadows) the gross returns are £2 *7s 7d* per acre less than with intensive farming. That these results are not to be attributed to the better conditions of the growth of plants, but chiefly to the increase of intensity, is shown by the figures of the last column but one: £100 worth of property yield with extensive farming only £ 14.8 gross returns, while with medium intensity these reach £ 18.5, and even with an increasing value of property still greater gross returns (19.1 per cent.) have been obtained.

The greater intensity of farming brings also a considerable advantage from the point of view of private economy.

The group of farms under extensive culture bears a quite inadequate interest on the capital engaged, namely 2.76 per cent., while the more intensive group yields upwards of 4 per cent., and the most intensive almost 5 per cent. But the farmer requires also interest on his working capital, at least 6 per cent.

TABLE II.

Group	Outlay per acre			4 per cent interest on value per acre			6 per cent interest on outlay per acre		Total			Net returns per acre			Ratio of interest to net returns
	£	*s*	*d*	£	*s*	*d*	*s*	*d*	£	*s*	*d*	£	*s*	*d*	
Extensive	3	15	9	1	2	7	4	7	1	7	2		15	7	100: 57
Medium	4	10	1	1	3	2	5	5	1	8	7	1	7	1	100: 95
Intensive	5	13	11	1	7	6	6	10	1	14	4	1	13	9	100: 98

The returns of extensively cultivated farms (see Table II) reach but little over one half of the interest required, in the medium group they are not far from it, while in the most intensively farmed groups an almost adequate interest is attained. To this it might be objected that these results are due to the fact that the properties of the extensively cultivated group are valued too high in comparison to those of the other groups. The writer maintains that he is justified in believing that the valuation of the various groups is correct, when the average result of large averages in the various groups is the same. In order to show that such is the case with the material under discussion, he distributed the farms independently of their previous grouping into three groups according to the height of their net returns taken as a basis for the land-tax (Grundsteuer-Reinertrages) : *a*) low, *b*) medium, *c*) high net returns as basis for land-tax (see Table III).

TABLE III.

	Net returns basis for land tax	Number of farms	Total value per acre	Net returns per acre	Interest per cent
	s d		£ *s d*	£ *s d*	
a) low	3 11	31	20 12 8	17 1	4.14
b) medium	7 2	34	28 19 3	1 5 9	4.28
c) high	12 9	32	40 1 5	1 12 3	4.02

The range of interest, 0.26 per cent., is so small that it may be completely neglected. A further proof of the reliable nature of the results is in the ratio of net returns to gross returns : in the extensive farms the net returns are less than the fifth part of the gross returns, while with increasing intensity they become more than a quarter of the latter (Table I). The author has also tried to test the trustworthiness of the results by checking the figures according to the rule of probabilities.

He then divides the 117 farms into progressive groups by collecting 41 farms in the first group and then successively removing the first farm from it and adding the one on the list following the last one of the group ; he thus obtains a series of 77 groups each of which represents the averages of 41 farms, the first being the group of most extensive farming and the last of the most intensive — Mitscherlich's method. This table also, which shows the progress of development not influenced by arbitrary division into groups, confirms the correctness of the results by the regularity with which interest and gross returns increase with the intensity of cultivation.

In order to make sure that the results can be generalized, the writer discusses from the same point of view the farms connected with the Bookkeeping Bureau of the Chamber of Agriculture of the Province of Silesia for 1907-08 and 1910-11. Here also the same facts are observed. The intensively cultivated farms yield 4.88 per cent interest, which is 2.30 per cent. more than that of the extensively cultivated farms. The writer therefore considers that it is not advantageous to organize on extensive lines where intensive culture would be suitable.

A second question arises: Does an intensification of culture in extensive organization promise success? (1).

In order to answer this question a table is given (Table IV) showing the interest yielded by averages of 117 farms, divided within the usual groups of degree of intensity also according to the amount of outlay.

TABLE IV.

	Extensive cultivation			Medium intensive			Intensive cultivation		
	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.	Outlay per acre
	£ s d		£ s d	£ s d		£ s d	£ s d		£ s d
Low outlay . . .	2 18 9	3.98	2 16 0	4 12 6	5.86	3 6 3	5 0 5	6.10	3 9 10
Medium	4 1 9	2.38	3 16 7	4 15 8	3.74	4 2 11	5 16 3	4.40	4 17 3
High	5 11 11	2.10	5 13 6	6 8 7	4.90	6 2 7	8 7 0	4.95	4 16 10

Only those extensively cultivated farms which limited their outlay show a satisfactory rate of interest approaching 4 per cent., while with the increase of the outlay the profits diminish considerably. This effect of increasing expenses is in nowise observed in the more intensively cultivated groups, though here also the farms with the smallest outlays were the most profitable. From the above it is also seen that it is not a question of high gross returns in themselves, but of high gross returns together with the lowest expenses.

In the group of extensively cultivated farms those with a low outlay show in comparison to their gross returns high net returns, which allow them an almost satisfactory rate of interest. But the gross returns in percentage of their value are strikingly low. From the point of view of public economy, these farms perform their duty only very imperfectly. When they attempt to do this better by increasing their expenses, their profitableness suffers (see Table V).

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(1) German economists call intensive culture in extensive organisation, the employment of much capital and labour on the crops cultivated; but crops are chosen, which, taken absolutely, require but little capital and labour, as for instance: meadows, forage crops and cereals. (*Ed.*).

TABLE V.

	Extensive		Medium		Intensive	
	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value
Low outlay	33.5	11.9	30.9	18.9	34.9	17.5
Medium „ . . .	14.6	16.3	19.5	19.2	22.5	19.5
High „ . . .	13.2	15.9	25.9	18.9	22.9	19.8

If the extensively cultivated farms are grouped on Mitscherlich's method according to increasing expenses, the rate of interest sinks at once, and from 3.97 per cent. descends to 1.99 per cent. The capability of increasing the crops with extensive organization can therefore only be limited. In order to afford a further proof for this statement a measurement of the total intensity has been made in the three groups of different intensity of cultivation by means of a score in which from one to three points were given to each of the following: Intensity of cultivation, amount of cash outlay, amount of live stock and amount of dead stock. Table VI shows the interest obtained for the various groups.

TABLE VI.

	Low total intensity	Medium total intensity	High total intensity
	per cent.	per cent.	per cent.
Extensive cultivation.	4.27	3.64	2.46
Medium intensive cultivation	3.53	4.44	2.99
Intensive cultivation	3.96	6.15	5.24

From the above it is seen that extensive cultivation allows only of a low total intensity, that also with medium intensive cultivation the increase of the total intensity is possible and suitable only to a certain degree, as in this case the farms with the highest total intensity yield the insufficient interest of 2.99 per cent., and that only the intensive group affords the greatest play room for the increase of intensity. The motto "Extensive organization with intensive cultivation" is only justified in the sense that in a farm the intensity may be diminished by laying down pastures and the amount of labour and money thus left free be applied to the fields in the form of more intensive working, etc. Forage crops and meadows, even with the most careful farming, do not allow of such an intensive cultivation as hoed crops. The more suitable intensive cultivation is from an economical point of view, the less may the organization be extensive.

The writer next raises the question whether from the above results conclusions may be drawn respecting the most advantageous intensity of cultivation according to the kind of soil. In order to answer this he arranged the farms in the three groups of different degree of intensity accord- to the net returns taken as basis for the land tax (Grundsteuer-reinertrag) and according to their total value. The results are shown in Table VII.

TABLE VII.

	Extensively cultivated farms. Interest per cent.	Medium intensively cultivated farms. Interest per cent.	Intensively cultivated farms. Interest per cent.
Low net returns taken as basis for land tax	2.52	4.91	4.98
Medium d.°	2.90	4.48	5.37
High d.°	1.59	5.38	4.38
Low value	3.65	5.06	5.17
High d.°	2.27	4.57	4.80

From the above it is seen that the farms with high net returns taken as basis for the land tax or with a high total value combined with extensive organisation yield a remarably low rate of interest: 1.59 to 2.27 per cent. Consequently the better the soil the less promise of success is held out by extensive organization.

The writer observes that the increase of live stock is no reason for the limitation of hoed crops, as every sugar beet farm where the cultivation of beets is economically advisable, is practically equal to a forage farm for the feeding of cattle, owing to the abundant masses of forage afforded by the beet residues.

In order to test the effect of the increase of intensity upon poor, average and good soils, the farms, in groups according to the intensity of cultivation, are arranged on Mitscherlich's method and show that both on poor and on medium soils the cultivation of plants usual to a more intensive cultivation affords a better interest on the capital employed: 3.10 to 5.37 per cent., and 2.44 to 4.61 per cent. The development in farms with the best soils takes the form of a curve in the following direction: 4.22—4.71—5.05—5.16—4.91—4.67. Here the optimum of intensiveness has probably been passed towards the end of the curve.

In conclusion the writer emphasizes the fact that the superiority of hoed crops, in so far as they are represented by sugar beets, appears in so great a degree only owing to the present prices of sugar, and that with the fall of these it is liable to diminish. On the other hand, the increase in the price of labour will probably be neutralized in the future by a relatively equal increase in the prices of agricultural produce such as cereals and live stock.

408 – Three Years' Returns of the Cooperative Association's Pasture at Kleinmühlingen in Anhalt.

BUTZ, O. Dreijährige Ergebnisse der Genossenschaftsweide Kleinmühlingen in Anhalt.— *Landwirtschaftliche Umschau*, Year 5, No. 7, pp. 133-135. Magdeburg, February 14, 1913.

The Grazing Cooperative Association of Kleinmühlingen, which was established in 1909, rented 29 acres at £3 3*s*. 6*d*. per acre as pasturage for young cattle.

The pasture was divided into three almost equal divisions surrounded by a barbed wire fence and provided with a wooden shelter and drinking troughs. The cost of making the pasture, etc., was as follows:

	£.	s.	d.
1. Making the pasture and compensation for existing crops.	14	4	2½
2. Seed	35	10	5
3. Chemical fertilizers	22	1	3½
4. Fencing	65	14	4½
5. Shelter	22	15	9½
6. Drinking-troughs	—	13	3
7. Wages of artisans	5	11	—
8. Wages of other persons	10	7	8
Total cost	176	18	—

The pasture was used on May 6, 1910, after a crop of grass worth £48 had been taken from one enclosure.

On April 25, 1911, and on April 23, 1912, 1.6 head per acre of young cattle with a live-weight of from 245 lbs. to 267 lbs. per acre, were turned in. The pasture in 1910 furnished 7000 grazing days, or 238 grazing days per acre; in 1911, a year of scarcity, only 5430, or 18⅗ grazing days per acre; in 1912, 7310 or 248 grazing days per acre.

The expenses of the three years work out as follows.

Years' Expenses	1910 £.	1910 s.	1910 d.	1911 £.	1911 s.	1911 d.	1912 £.	1912 s.	1912 d.
1. Rent	93	2	0	93	2	0	93	2	0
2. Fertilizers	24	10	0	30	17	5	24	10	0
3. Amortisation of capital expended (10 % on £176 18s.)	17	12	9½	17	12	9½	17	12	9½
4. Interest paid	7	1	1½	6	7	5	5	14	8
5. Wages	2	14	10½	5	14	10½	3	13	6
Total outlay	£145	0	9½	£153	14	6	£144	12	11½
The cost of a day's grazing (allowing for the hay crop of 1910) was thus			3.3*d*			6.69*d*			4.71*d*

409 - Native Labour in Tunis.

CHENEVARD, W. La main-d'oeuvre agricole indigène en Tunisie. — *La Revue des Colons de l'Afrique du Nord*, Year II, No. 7, pp. 103-106. Algiers, February 13, 1913.

The number of native agricultural labourers in Tunis is estimated at 220 000. If the native remains a whole year on the same farm, he receives a monthly wage of from 32*s* to 44*s* according to the district and his age. The day's wage, at ordinary times, is from 1*s* 1 ½*d* to 1*s* 3*d*, but at harvest, it rises to 2*s* or 2*s* 2*d*. On the estates of the native proprietors, the native labourer receives, in addition to his keep, a yearly wage of about £8 to £12. Very varied contracts are made between employer and labourer according as the latter is employed as shepherd and cowman, in the cultivation of cereals, or in growing fruit, this being mostly olives. A shepherd is usually entrusted with a flock of from 100 to 150 sheep and goats; in the spring, the owner provides him with an assistant. The shepherd's wages are about one tenth of the animals born, about £2 worth of clothing and 6 to 8 cwt. of barley and wheat. He is responsible for all losses which he cannot prove to be due to circumstances beyond his control. The wages of the cattleman are calculated according to the number of animals over one year of age and reach per head per annum, according to the size of the herd and the custom of the district, from 1*s* 6*d* to 6*s* 6*d*.

In the so-called *Khammessa* Contract the labourer (Khammes) takes over from the landowner 20 to 35 acres, according to the fertility of the land, for growing corn. The landowner allows the labourer the use of a pair of oxen, a plough, and the necessary seed-corn, and provides him with all that is required for the support of himself and his family. As wages, the labourer receives the fourth or fifth part of the harvest. It is difficult to reckon the annual earnings of such a man, especially if the terms of the contract permit him during his spare time to work on a neighbouring estate. The writer estimates his annual wages at £16 to £20.

The European colonist sometimes gives the native labourer only half the seed-corn and a helper only at harvest time, so that the latter has to provide his team and plough, or he gives him a small sum of money in adition to everything which is necessary for his work. The labourer now more generally claims half the crop as his share. It is rare for the proprietor to pay by the piece, for in this case the quality of the work suffers.

The work contracts affecting the cultivation of vegetables in the irrigated districts are also very various. If the labourer is given the use of the animals necessary for drawing water and a small sum of money in addittion, he bears all the working expenses and receives, as part of his wages, half the net yield. If the labourer does not enjoy the first two advantages, the landowner has to pay for the hoeing and only receives a quarter of the gross yield. If the owner is able to supervise the market-garden, it is advisable to provide the native with better seed, a complete set of tools and the requisite manure, because the net gain for a capital of £80 to £120 thus laid out, amounts to about £60 to £100.

In the case of the so-called *Mgharsa* Contract, the owner gives the labourer a piece of uncultivated ground on condition that he clears it of bushes and weeds and plants it with s specified kind of fruit-tree (olive, almond, fig, etc.). The labourer receives as wages, when the trees begin to bear, half the fruit crop. If the owner does not wish to appropriate his share, he can make a further contract with the labourer (*Moucakate*), according to which the latter undertakes the further care of the plantation and receives for this two-thirds of the whole crop. If the ground also beans intercalary crops, the labourer receives four-fifths of the produce.

410 – **Agricultural Book-keeping in Austria.**

1. Sitzung des Zentralkomitees zur Verbreitung der Buchstellenergebnisse. — *Österreichische Agrar-Zeitung*, Year IV, No. 6, p. 65. Vienna, February 8, 1912.
2. POSTELT, A. Wie sollen die Mittel zur Erhaltung der Buchstellen aufgebracht werden? *Ibid.*, pp. 61-63.

Agricultural book-keeping bureaus are at present in operation in the following parts of Austria: Lower Austria, Upper Austria, Styria, Salzburg, Carinthia and Tyrol, also in the district under both sections of the Council of Agriculture (Landeskulturrat) for Bohemia and Moravia (the bureaus in the German section are in course of being established), in the Bohemian portions of Silesia, and in Cracow, Lemberg and in the districts of the Council of Agriculture of the Bukowina. The work of these book-keeping bureaus consists in the accurate keeping of the books of over 1200 estates of different size.

The "Zentralkomitee zur Verarbeitung der Buchstellenergebnisse" in Vienna, which has hitherto only been occupied with establishing new book-keeping bureaus, and working out uniform regulations for the intercourse between these offices and the farms connected with them, will now turn its attention to working up the data which have been observed in the case of the different estates, their total profitableness and the cost of production, and will consider them under the heads of: Crownlands and their natural spheres of production; the economic position of the farm and its relations to factories; the mutual relations of the parts, *i. e.* whether the various portions are contiguous or scattered; further the chief source of income (cattle breeding or agriculture), the principal crops grown (cereals, roots, fodder, meadow, etc.), the intensity of the farming, the technico-commercial side of the farming and other important points of view.

In this way, it will be possible to bring single cases into their original connection with the whole, and at the same time to obtain an excellent picture of the condition of agriculture throughout Austria.

The principle aim and the *sine qua non* of the success of an agricultural book-keeping bureau is not only to keep correct accounts of every event taking place in the farm, but above all, the power of drawing correct conclusions from the books which enables it to give good advice to the farmers so that they can avoid insuccess and obtain the largest possible return from the property under the circumtances.

The 119 members of the Book-keeping Bureau of the German section of the Moravian Landeskulturat send to the bureaus every week a detailed report of all the events of the farm. Three persons are employed in registering and entering these reports.

One person is entrusted with the whole correspondence of the Bureau, two close the accounts and balance the ledgers, while one works up the statistics of all the farms from a politico-commercial standpoint. The last-mentioned, but most important person, is the Head of the Bureau, who after the accounts have been done and the balances struck, reckons the cost of production and draws up the final reports in which the written economic advice is given; he further also visits the different farms and thus keeps in personal touch with the proprietors. The necessary funds for carrying on such a Book-keeping Bureau amount, according to the estimate for 1913, to £392 18*s*.

This sum is apportioned in the following manner:

	£	*s*	*d*
1. Salaries of officials and assistants	254	15	6
2. Cost of actual necessities and of publications . . .	109	16	4
3. Cost of establishing courses of instruction	28	6	2
Total . . .	392	18	0

These expenses are covered by:

	£	*s*	*d*
1. A grant from the Ministry of Agriculture of . . .	83	5	2
2. The local grant of	31	4	5
3. Members' contributions	20	19	7
4. Shares of the State and local grants	257	8	10
Total . . .	392	18	0

The German section of the Moravian Landeskulturrat devotes to the support of its Book-keeping Bureau 3.5 per cent. of all the grants which it receives from the State and the local authorities; and the Minister of Agriculture has recognized the right of using a part of the grants for the maintenance of Book-keeping Bureaus.

In the opinion of the writer, it would be a mistake to offer farmers compensation for the expenses incurred in making the weekly returns; the small trouble entailed by these weekly reports should be fully compensated by a conviction of the great value of accurate book-keeping and by the calculation of the cost of production.

AGRICULTURAL INDUSTRIES.

DAIRYING

411 - Extract from the Report of the Swiss Dairy Institute in Berne for the Year 1911.

BURRI. Aus dem Tätigkeitsbericht der Schweizerischen milchwirtschaftlichen Anstalt Bern für 1913. — *Landwirtschaftliches Jahrbuch der Schweiz* 1912, pp. 469-491. Bern, 1912.

I. *Studies on cheese-making.* — Investigations of the curding process show that, when the time of coagulation is short, the amount of para-casein produced is more than when it is prolonged. The writer now raises the question whether the production could be increased, without detriment to the quality of the cheese, by reducing the coagulation time. Experiments made in order to find an answer to this query prove that the amount of cheese can be increased 0.3 to 0.4 per cent without detracting from the quality of the cheese, if the separation time is reduced by one-third. The writer therefore concludes, that in cases where a firm curd is required, this can be attained by shortening the curding time.

II. *Determination of the solids in milk.* — As the direct determination of the solids in milk is not effected everywhere in the same manner, Dr. Burri made experiments to ascertain which of the methods used produced the best results. These latter were attained by the simplest method, which consists in heating 5 cc. of milk in a flat nickel dish in an ordinary desiccator at 100° C. until it reaches a constant weight.

III. *The effect produced upon the Schardinger reaction by the cooling of milk.* — Several investigators have maintained that the Scharding enzyme adheres to the fat globules. The writer says that, if such is the case, the fact of the fat of the globules in the milk being solid, or in a liquid condition, is possibly not without effect on the enzyme action. This supposition has proved entirely correct as is shown by the following summary of the experimental results.

If the Schardinger reaction is carried out with fresh milk which has been cooled for one hour to at least 10° C., discoloration occurs many minutes sooner than in the case of the same, but uncooled, milk. Cooling down to freezing point produces no further difference. The alteration in milk which is cooled for an hour is detected by the more rapid change of colour on carrying out the Scharding reaction, and can be partially removed if the milk is again heated to about 45° C. immediately on the conclusion of the cooling period. The condition is more stable, however, if two hours are allowed to elapse (reckoned from the beginning of the cooling), before the milk is again heated.

IV. *Experiments in the reducing effect of cows' milk* — The writer maintains that the actual reduction process is hindered, not only by the molecular oxygen above, but also by that present in the reagent; further that on heating milk, reducing substances are produced, which under some circumstances counterfeit others which are absent. In conclusion he states that when milk containing many bacteria and which has not been heated is used, the Scharding reaction at 45° to 50° C gives no conclusive evidence as to the amount of enzyme present, for its reducing effect is masked by bacterial activities in the same direction.

412 - The Alpine Dairy Industry.

Milchwirtschaft auf den Alpen. — *Alpwirtschaftliche Monatsblätter*, Year 47, No. 2, pp. 40-51. Solothurn, February 15, 1913.

A. *Milk yield.* — During the last ten years, the keeping of milch cows has on the whole declined on the Alps, although the number of young cattle there has increased. Thus in 1864, there were in Obwalden, on 202 alps 5 848 cows, while in 1902; there were only 4 166 cows on 290 alps; in 1864 in the Grisons, the number of cows on 596 alps was 28 890 with a milk yield of 2 139 955 gallons and in 1909 the number of cows on 822 alps was only 26 173 and the milk yield 2 364 221 gallons.

The Alpine Statistics for 1911 give the following figures regarding the dairy industry throughout Switzerland: milch cows, 180 564; average grazing time, 91.3 days; total of grazing days, 16 485 493; amount of milk, 25 423 900 gals., thus the milk yield per cow and grazing day is 6.16 quarts, as against 5.30 quarts in 1864. If the goats' milk, 3 269 818 gals., is added to the cows' milk, the total milk yield of 28 693 718 gals., taken at about 7 ½*d* per gals., represents a round sum of £860 000.

B. *Utilization of Milk and Alpine Bookkeeping.* — The writer shows from some examples that wherever bookkeeping is accurately practised in the Alps, the net profit per gallon of milk has greatly increased, for only by an accurate system of bookkeeping, can milk be used in the most remunerative way. While in districts where the old dairy system prevailed, the net price per gallon of milk was from 4 ½*d* to *6d*, the collective and co-operative dairies with modern conveniences (at Davos a funicular railway has been made for milk transport) obtained a price of 9*d* to 10*d* per gallon.

C. *Dairy products.* — The chief work of the Alpine dairies is the manufacture of whole milk cheeses, skimmed milk cheeses and butter for the market. But in many mountain districts, in spite of the high fat content and rich taste of the Alpine milk, the dairy products are not of first quality. This is often due to the want of a properly instructed staff and the primitive arrangements, apparatus and buildings. Single dairies do not possess the technical means necessary for the production of goods of the best quality. A further evil is that the butter is stored up in the herdsmen's huts and made into cooking butter, which is a cause of much loss to Alpine dairies. The Alpine statistics of the Grisons give the yearly out-put of butter as 693 000 lbs.; of this about two-thirds, *i. e.* 462 000 lbs., is stored and then melted down.

Fresh Alpine butter fetches on an average 1*s* 2*d*. per lb.; thus the stored butter, if it had been used fresh, would have been worth £26 950. The average value of stored butter in autumn is only 11 ½*d*, so that the

462 000 lbs. are only worth £22 137, which is a loss of £4 813. In addition, the butter loses 5 per cent. on melting and therefore in value, so that the total loss is £6 160.

413 - The Manufacture of Cheeses in the Grisons from Skimmed Cow's Milk and Whole Goat's Milk, and the Utilization of these Milks in Germany.

KRAEMER, H. Zur Frage der Bereitung von Käse aus Kuh-Magermilch und Ziegen-Vollmilch in Graubünden und ihre Nutzanwendung auf deutsche Verhältnisse. (Nach hinterlassenen Manuskripten von Bruun von Neergaards). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft,* Nos. 6, 7 and 9, pp. 84-87, 103–105 and 149-151. Berlin, February and March 1913.

In the Bünden Alps (Switzerland), where the high Alpine pastures with their countless ravines support few cows and many goats, the scanty population and steep Alpine paths make the manufacture of whole milk cheeses a difficult matter during the grazing season; for this reason cheeses are made from skimmed cow's milk and from whole goat's milk.

The writer has investigated to what extent the milk is utilized in these two products, and chose for observation alps with a southern exposure and soil rich in lime. On these were pastured during the grazing season, from June 20 to September 20, 45 cows and about 40 young cattle, with 60 goats; 3120 gals. of cow's milk and 598 gals. of goats milk were made into cheese during this time by the 7 partners. The total gross yield was as follows:

	£	*s*	*d*
1 172.60 lbs. butter	58	1	9
2 589.40 lbs. cheese	44	6	7
499 gals. buttermilk	2	14	0
2 702 gals. whey	4	17	4
Total . . . . £	109	19	8

One gallon of milk therefore produced a gross return of 7.09*d*. If the value of the butter, buttermilk and goat's milk (598 gals × 7.09*d* = £17 14*s* 2*d*) is subtracted, we get the gross return of the skimmed milk; this is £109 19*s* 9*d* — (£58 1*s* 9*d* + £2 14*s* 0*d* + £17 14*s* 2*d*) = £31 9*s* 10*d*.

The gross return of the whole cow's milk is therefore £58 1*s* 9*d* + + £2 14*s* 0*d* + £31 9*s* 10*d* = £92 5*s* 7*d*.

The cost of working it up was 0.56*d* per gallon or £7 6*s* 3*d* for the total cow's milk; thus the sale price of the whole cow's milk was $\frac{£92\ 5s\ 7d\ -\ £7\ 6s\ 3d}{3120}$ = 6.52*d* per gallon. If the whole milk is to be used in the valley, it fetches thus 6.05*d* per gallon.

The high value of the cow's milk is to be attributed, partly to its high butter content, partly to the increased price of butter in summer and to the increase in the value of the cheese, owing to the admixture of goat's milk. The writer calculates that one gallon of skimmed cow's milk when mixed with goat's milk, is worth about 0.62*d* more, and one gal. of whole cow's milk when mixed with goat's milk is worth about 0.49*d* more than when cow's milk only is used for making skimmed milk cheese.

It is very important for making such cheeses that a certain amount of goat's milk be available, for the cows give most milk at the beginning of the Alpine season, but the goats are not in full milk till 5 or 6 weeks later; therefore in order to make cheeses of equal quality at the beginning of the season it is necersary to add whole cow's milk.

At the end of the Alpine season, as the amount of goat's milk added must be relatively larger and the price of butter has risen, the skimmed milk must have more cream removed.

From these facts, the writer concludes that goat's milk could be used for cheese-making in some parts of Germany. Through employing mixed cow's and goat's milk, the quality of skimmed milk cheese could be improved in Germany, the skimmed milk could be turned to better account, and a large amount of milk protein utilized as a food for the people.

414 - On the Forms Assumed by Phosphorus and Calcium in Milk Casein.

LINDET, L. Sur les formes que le Phosphore et le Calcium affectent dans la Caséine du lait. — *Annales de l'Institut National Agronomique*, Series 2, Vol. XI, Part 2, pp. 213-222. Paris, 1913.

These four series of analytic researches aim at showing that a portion only of the phosphorus (about half) occurs as a phosphate, probably tricalcic, while the other enters as phosphoric acid into a combination, which can be hydrolised by alkalis. As for the excess calcium left over from the formation of calcium phosphate, it neutralizes the acidity of the casein, but this neutralization is only partial; for casein can be made to absorb more than 7 per cent. of calcium, in the same manner as it will absorb aluminium, zinc, etc. It is probable that the calcium phosphate is itself broken up by this acidity, for calcium caseinate can be saturated with phosphoric acid without the liquid becoming turbid i. e. without the deposition of the phosphate formed. It is equally possible that calcium phosphate is soluble in calcium caseinate, for the casein precipitated by rennet is entirely soluble, without any deposit of phosphate of lime, in ammonia, or even in concentrated resorcine.

The writer concludes that phosphoric acid and calcium form three groups of mineral elements: 1) calcium combined with the acid hydroxyl; 2) calcium phosphate, probably tricalcic, and 3) phosphoric acid retained by the protein molecule and capable of being detached by hydrolysis or saponification.

The study of the sulphur contained in the casein molecule will be the subject of a further communication.

415 - The Jerked Beef Industry in Argentina.

MEAT INDUSTRY

RICHELET, JUAN E. Industria saladeril en la Argentina. — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 9, pp. 986-1029. Buenos Aires, 1912.

It has often been objected against salted meat that it does not offer sufficient guarantee from a hygienic point of view. According to the writer, nothing can be more erroneous in the case of Argentine meats. In that country the "saladeros" are sumitted to continuous sanitary surveillance; to such an extent that the inspection fees together wth the duty on salt (9*s*. per ton) and the provincial taxes (4*s* per head) weigh heavily on the industry and contribute to hinder its full development.

Preparation of "tasajo". — The animals whose flesh is dried are of the native type ("criollo"), bred in the open and their average live weight is 920 lbs. The amount of dry meat they yield varies from 136 to 235 lbs. The sanitary regulations which govern the industry and which provide very severe penalties against transgressors, allow nothing but salt to be used in the industry. Only Cadiz salt, which is very pure, is used. Of recent years some works have begun to use "mantas" (the muscular mass from the jaws, the neck and the ribs up to the hip bone) for the preparation of dried meat, and "postas" (the mass of muscles freed from bones of each limb, for canned meats and extracts. The animals, after being inspected by the veterinary surgeon, are slaughtered, bled, flayed, and quartered. The "mantas" and the quarters are freed from the excess of fat and cut up into pieces of more or less uniform size. The flesh is sometimes washed, but as a rule it passes at once through one or more (generally three) vats of brine; it is then stacked with salt into heaps about 10 feet high. The stacks are undone every day. The meat is hung in the sun for 7 or 8 hours and the stacks are remade in inverse order. The process lasts from 12 days to a month according to the weather. "Tasajo dulce" is not so salty as the other and is dried in an esiccator.

The drying of mutton has also been attempted, but hitherto no method has been found for freeing the meat from its characteristic odour.

In the provinces of Salta and Jujny "Chalona" is prepared; this is dried and salted mutton and it is exported to a great extent to Bolivia.

Prices of dried meat. *

	£	s	d		£	s	d	
For Cuba: « postas » (*f. o. b. Buenos Aires*)	1	1	0	to	2	0	6	per cwt.
» Brazil: « mantas » (*in depot in the Brazilian ports*).	1	15	0	to	3	0	3	»
» » « mantas » and « postas » » » »	1	8	6	to	1	16	6	»

* In September 1912 the price at Montevideo was £2 4*s* 6*d* per cwt.

Expenses of Importation into Brazil.

	s	d		s	d
Customs duties, per cwt.	6	4	+	11	5
Port dues, per cwt.		2			
Commission, warehousing, per cwt.	4	5			
Total . . .	22*s* 4*d* per cwt.				

corresponding to 37*s* 1*d* per head (187 lbs. of « tasajo »).

Animals slaughtered for the preparation of dried meat.

Year	Argentina	Uruguay	Brazil	Totals
1891-92	764.400	707.800	485.000	1.957.200
1901-02	454.000	813.400	375.000	1.643.000
1910-11	264.415	698.179	499.500	1.461.794
Yearly Average 1891-1911 .	453.494	783.289	368.816	1.605.589

In 1909, 185 100 head of cattle were slaughtered in the principal Argentine factories for the preparation of meat extracts and preserved meats.

The writer refers to a series of analyses and of digestibility tests (made by Dr. Lavenir and Dr. E. Moreno of Cuba) on the nutritive value of dried meat.

Trade.

Exportation of jerked meat from Argentina.

	Tons	Value £		Tons	Value £
1870-74 . .	166 206	1 324 351	1895-99 . .	175 817	2 789 396
1875-79 . .	165 803	2 312 486	1905-09 . .	62 197	2 070 682
1880-84 . .	114 088	2 886 008	1910. . . .	9 293	204 882
1885-89 . .	159 091	3 954 366	1911. . . .	12 975	—
1890-94 . .	208 457	4 022 445			

The jerked meat industry has been much injured by the rise of the cold stored meat trade, and yet the two industries do not exclude each other, because they utilize different animals and supply different markets. Some of these could absorb still greater quantities of jerked beet, than those actually supplied, while new ones could be opened. Among the first, Brazil is to be mentioned.

In 1912 there were in the State of Rio Grande do Sul, Brazil, 20 "saladeros." They were not, however, sufficient to satisfy the demands of the population of Northern Brazil, whose chief food is jerked beef. In 1906 the production of jerked beef in Rio Grande do Sul was 80 240 559 lbs. In the same year the three States of Para, Pernambuco and Bahia alone consumed 58 364 570 lbs. of this meat. In 1907 the State of Rio Grande do Sul consumed 78 899 014 lbs. of it, or almost the whole local production. In 1908 Brazil consumed 192 951 028 lbs. of jerked beef, whilst the production of Rio Grande do Sul was barely one third of the consumption of the whole country.

The repeated attempts to dry meat in Cuba did not prove successful, owing to the climate being too moist and not warm enough. Similarly all attempts made in Venezuela, in Mexico and in the United States have failed.

Other markets in which jerked beef might be introduced or imported in larger quantities than at present, are the African colonies, Bolivia (which consumed this food up to a short time ago), Peru, Spain, and Portugal) (which might increase considerably their present consumption), and Sweden and Norway (which import salted meats in barrels from the United States), Porto Rico (which has 1 150 000 inhabitants and only 398 000 head of live stock, of which 303 000 are cattle), Jamaica, the Antilles, the Republic of San Domingo, Haiti, etc.

416 - **A Method for the Determination of Starch in Meat Food Products.**

PRICE, T. M. *U. S. Department of Agriculture, Bureau of Animal Industry, Circular 203.* Washington, 1912.

The writer gives a short account of the methods hitherto used for determining the amount of starch present in meat products and afterwards gives a detailed description of his own method, which is rapid and sure and can be carried out without the use of an autoclave.

417 - **The Sugar Industry in North-East Brazil.**

SUGAR INDUSTRY

SERRE, PAUL. L'industrie sucrière dans le Nord-Est Bresilien. — *Bulletin des Séances de la Société Nationale d'Agriculture de France,* Vol. LXXII, No. 10, pp. 937-949. Paris, December 1912.

The St. Vincent sugar cane was introduced into Brazil shortly after its discovery and notably into the States of Pernambuco (1534) and São Paulo. For a long time, Brazil was the principal sugar-producing country, but it now occupies the sixth place, coming after Cuba, the East Indies, Java, North America and Porto Rico. Cane sugar is made in 15 out of the 21 States of the Federation, the annual production being about 300 000 tons.

From enquiries made by the writer, it appears that there are 86 sugar factories in the six states of North-East Brazil, viz.

Bahia.	22	Sergipe	10
Pernambuco.	42	Parahyba do Norte . .	4
Alagoas.	6	Rio Grande do Norte .	2

There are, further, in the States in question a very large number of "engenhos" (which can be regarded as semi-factories) and "bangués" (of which there are about 1 500 in the State of Pernambuco alone), which make "muscovado" sugar (average extraction 5.5 to 6 per cent.) for local consumption and the market of the interior.

The 22 sugar factories of the State of Bahia are reported to have produced in 1911-1912, 316 992 sacks of white sugar (first and second refinings) of 132 lbs. (60 kg.), of which a large portion (189 726 sacks) has been exported to the different States of Brazil; only 151 sacks have been despatched to foreign ports. The molasses, which are still very rich, are sent to the cooperative distillery of Santo Amaro.

The 6 factories of the State of Alagoas have produced during the same season 188 000 sacks of white sugar, while the output of its 200 "engenhos" is from 400 000; to 450 000 sacks of "muscovado", all in sacks containing 165 lbs. (75 kg.). The four other States have produced approximately:

	Sugar of three qualities
Pernambuco	1 600 000 sacks of 75 kg.
Sergipe	65 000 » » 60 »
Parahyba do Norte	120 090 » » 75 »
Rio Grande do Norte	50 000 » » 75 »

According to the statistics of the federal customs, the direct and total exportation of sugar in 1911 amounted to 79 824 820 lbs. (probable value on board £408 506); of this only 680 487 lbs. were white sugar, as against 67 401 tons in 1909. The importation in 1911 was only 609 878 lbs. (probable value on board £6 963).

In 1909 (latest statistics) the total exportations were 151 055 200 lbs. viz:

White sugar (powdered)	933 600 lbs.
» » crystallized	76 900 »
Demerara sugar (N. 13 of the Dutch scale)	76 394 700 »
Muscovado	73 650 000 »

The chief buyers were:

Great Britain	112 492 800 lbs.
Agentina	24 070 500 »
United States	13 275 600 »

Average price per cwt. (taking the milreis at 16 $^1/_5$ *d.*):

	1909. £ *s* *d*	1908. £ *s* *d*
White sugar	1 3 5	1 13 6
Demerara	10 10	14 6
Muscovado	9 4	11 5

A tax is put upon exported sugar; this is 1 per cent. in the State of Bahia and 9 per cent. in Pernambuco.

The cultivation factor is always neglected in Brazil. Experiments in cane selection and reproduction by seed were begun, but soon abandoned. Without any system of rotation, without fertilizers or new varieties of canes, the average yield per acre is about 20 tons and, on account of defective methods, 6 per cent. of sugar is obtained from a cane containing double the amount. The yield is 8 to 9 per cent. in Pernambuco and 7 to 8 per cent. in Bahia ; in the former State more brown sugar is made than in the second. In a sugar plantation at Atalaia (State of Alagoas), which was managed scientifically, the cane production reached 32 tons per acre.

On account of the small wages paid to the labourers, (1 400 reis = 1*s* 11*d*. per day), the cost of producing sugar is generally between 1*d* and 1 ½*d* per lb.

As for the industrial factor, it may be said that a modern factory is a very rare thing in North-East Brazil. There are only 3 well appointed factories out of 86. Most of them are old factories done up at small expense and they are usually deficient in up-to-date apparatus. The juice is, as a rule, badly manipulated and no attempt is made to economize fuel.

418 - White Liqueur Wines.

WINE-MAKING

LABORDE, J. Les vins blancs liquoreux. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1000, pp. 233-235. Paris, February 13, 1913.

White liqueur wines are a special kind containing a larger or smaller amount of grape-sugar, which has escaped fermentation, and a larger proportion of alcohol than usually occurs in ordinary wines and which is wholly derived from the transformation of the sugar in the original must. The alcoholic content of these wines varies from about 13° to 16°, but this latter figure is often exceeded; therefore the glucometric degree of the must should be higher than 14° Beaumé. It is thanks to two natural occurrences, partial drying and *Botrytis cinerea*, that the grapes are able to become so rich in sugar. The former is used especially in hot countries, where so-called " vins de paille " are produced, these are wines made from grapes that have been partially dried on layers of straw: they are liqueur wines, but their production is very limited.

The great majority of liqueur wines are obtained through the agency of a mould, *Botrytis cinerea*, and they are made in the following districts: Sauternes and the neighbouring districts on the two banks of the Garonne, the hills of Monbazillac in the Bergerac district, certain parts of Anjou (the Layon valley and the district of Saumur), and finally in Germany, in the Palatinate and on the banks of the Rhine and the Moselle.

In order that *Botrytis cinerea* may have a favourable effect on the grapes its presence must be attended by the following circumstances:

1. A temperature a little above the ordinary, a sufficient degree of moisture, but the damp must not be continuous *i. e.* the rainy periods should be followed by longer periods of fine weather.

2. The grapes must be the fruit of selected vines and have fairly resistant skins and very sweet juice; in the Bordeaux and Bergerac districts these conditions are fulfilled by the Sémillon and Sauvignon va-

rieties, in Anjou by Chenin Blanc, and in Germany by Riesling and Traminer.

3. The wines should be grown in somewhat dry soils with an exposure favourable to early ripening; the attacks of the parasite are then restrained, but if the fungus occurs on unripe grapes, the disease is more severe and gives rise to grey rot, which is always fatal.

Grapes attacked by *Botrytis* soon die and have a tendency to dry if external conditions permit. As the crop is successively invaded, it is possible to find on the same vine: 1) healthy grapes, with golden, brilliant, smooth skins; 2) those which are completely rotten, with smooth, but brown and dull skins and which do not bear the external parts of the fungus; 3) grapes which are burnt up ("*rotis*") *i. e.* wrinkled and shrivelled by partial desiccation, and bearing more or less abundant tufts of mould, though the latter are sometimes absent, as in the September attacks, when the temperature is higher and the weather drier than it is in October.

The vintage begins as soon as a certain number of burnt-up grapes make their appearance; the berries are gathered one by one at first; when the rot spreads, portions of the bunch are taken, but the whole crop is not gathered until after 7 or 8 successive pickings. The vintage is pressed as it is gathered; the operation is always difficult on account of the viscous consistency of the rotten grapes and the concentration of their juice. The density and colour of the must derived from the same pomace increases with pressing, so that it is necessary to equalise the must obtained.

The musts are classed as "head", "centre" and "tail" must, and their quality, generally speaking, is in a descending order; the corresponding wines are designated in the same manner. Frequently in the Gironde district the concentration of "head" wines may be from 350 to 500 gr. per litre, or from 14 to 30° Beaumé; in the other *Botrytis* regions such a high sugar content is much more exceptional, and in order to obtain it, the vintage must be prolonged sometimes as late as December.

The physical effect of the *Botrytis* rot is accompanied by physiological changes; these are shown by a relatively high consumption of acidity, which allows, by natural concentration, of a considerable increase in the amount of sugar present without the acidity exceeding its normal limits. Different secretions are also formed: thus a large amount of glycerine is produced, which increases the oiliness of the wine; also mucilaginous substances, which, though they are for the most part eliminated, still leave certain residues giving mellowness to the wine; and finally a large amount of oxydase, the effects of which have to be neutralized by energetic treatment with sulphurous acid.

The fermentation is very slow and in the Bordeaux district only finishes in January or February. At this time the wine is drawn off and treated with sulphurous acid fumes to prevent any continuance of fermentation due to a rise in temperature, which would be injurious to the quality of the wine, causing it to lose its sugar and to resemble Madeira.

The sulsequent operations consist in racking and fumigating with sulphurous acid every three or four months, and in clarifying the wine. It can only be bottled after having remained in the casks for two or three years; a short time after this, Sauternes wines can be used. If they have to be kept long, it is necessary for them to contain at the time of bottling, sufficient sulphurous acid to hinder oxidation and prevent their resembling Madeira, which would spoil them completely.

In the case of the Monbazillac wines, on the contrary, a brown colour, almost mahogany, and a pronounced rank smell and taste are the characters most prized in old and very liquorous wines. Sometimes the bottling does not take place till the wine has remained for 8 or 10 years in casks, owing to fermentation setting up again, liberal applications of sulphurous acid being powerless to prevent it.

It is also due to relative insufficiency of sulphurous acid, when liqueur wines of Anjou, which are usually bottled very soon, become gradually, and of their own accord, more or less sparkling. After ripening, if they preserve their liqueur character together with a slight effervescence or "pearly" appearance, these wines possess an assemblage of quite remarkable properties.

The Rhine wines, althongh they possess special qualities due to the varieties of vine and to the soil, yet resemble, to a certain extent, either the Sauternes or Monbazillac wines according to their sugar content and the amount of sulphurous acid with which they have been treated.

419 - **The Ageing of Bottled Wines.**

GAYON, U. and DUBOURG, E. Sur le vieillissement des vins en bouteilles. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1000, pp. 200-202, 1 fig., 1 plate. Paris, February 13, 1913.

Oxygen plays a preponderant part in the evolution of wine; it is therefore clear that the latter ages more slowly the slower the air is in reaching the vessels which contain it. For a long while, wine makers have tried to hinder the access of air to bottled wines of good quality. More than a century ago, they tried to attain this result by using corks double the length of those now employed (Château-Lafite 1808). Later recourse was had to ground glass stoppers (Chateau Lafite 1820-1825), but these were given up on account of the difficulty of opening the bottles. Now-a-days, wine is kept in bottles of variable sizes and closed with cork stoppers. The following are some of the sizes used in the Bordeaux district: ½ bottle (0.67 pint); Frontignan bottle (1.61 pint); Magnum (2.64 pints or 2 bottles); Imperial (5.28 pints or 4 bottles) and Jéroboam (10.56 pints or 8 bottles).

Experience has shown that the larger the vessel used, the fresher and better the wine keeps, while, on the contrary, it ages perceptibly quicker in smaller bottles.

This is due to the fact that the cross section of the neck is about the same in all bottles. The following analyses, made in 1911, show that, other conditions being the same, the changes which take place in the composition of the wine are greater in small than in large bottles.

Léoville-Barton 1881.

	½ bottle	Whole bottle
Total acidity	3.83 gr.	3.72 gr.
Volatile »	1.07 »	0.95 »
Ethers	0.551 »	0.514 »
Deposit	27 mgr.	25 mgr.
Proportion of deposit to volume .	$\frac{27}{1} = 27$	$\frac{25}{2} = 12.5$

Pape Clément 1887.

	½ bottle	Bottle	Magnum
Total acidity	3.42 gr.	3.25 gr.	3.23 gr.
Volatile »	0.60 »	0.58 »	0.59 »
Ethers	0.408 »	0.364 »	0.316 »
Deposit	14 mgr.	28 mgr.	31 mgr.
Proportion of deposit to volume	$\frac{14}{1} = 14$	$\frac{28}{2} = 14$	$\frac{31}{4} = 7.7$

Malescot Saint-Exupéry 1893.

	½ bottle	Bottle	Magnum
Total acidity	4.20 gr.	3.98 gr.	3.75 gr.
Volatile »	1.26 »	1.24 »	1.18 »
Ethers	0.536 »	0.498 »	0.483 »
Deposit	130 mgr.	205 mgr.	380 mgr.
Proportion of deposit to volume.	$\frac{130}{1} = 130$	$\frac{205}{2} = 102.5$	$\frac{380}{4} = 95$

At the time of analysis, all these wines were in a good state of preservation.

Thus the relative deposit decreases with the increase in size of the bottle, the acidity and ether content are less, the flavour is less developed, in a word, chemical analysis here confirms the opinion of the taster: wine ages more slowly in large than in small bottles.

OTHER INDUSTRIES DEPENDING ON PLANT PRODUCTS

420 - California Fruit and Nut Output.

Daily Consular and Trade Reports, 16th Year, No. 27, p. 579 Washington, February 1, 1913.

The following comparative statistics are from the *California Fruit Grower*, and represent the output of that State in the leading fruit and nut crops. Citrus-fruit shipments were 46 394 cars (1) in 1910-11 and 40 290 cars in 1911-12.

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(1) The California Carload is of 24 000 lbs. (Powell-Wallschlaeger), *The Italian Lemon Industry*, p. 9. Los Angeles, 1913. (*Ed.*)

Canned fruit and vegetables	*1909*	*1910*	*1911*
	cases	cases	cases
Apples	69 975	76 830	65 300
Apricots	664 110	743 160	858 325
Blackberries	49 955	62 025	77 825
Cherries	181 935	195 195	198 805
Grapes	24 470	45 645	70 915
Loganberries	4 012	12 639	19 117
Nectarines	14	1	23
Pears	501 440	619 355	618 920
Peaches	1 436 160	2 145 450	2 091 125
Plums	89 425	80 360	165 840
Raspberries	3 590	10 126	3 625
Strawberries	10 580	14 073	7 715
Other fruit	1 335	3 690	5 115
Total fruit	3 037 001	4 008 549	4 182 650
Asparagus	410 965	617 275	687 065
Beans	12 435	46 250	65 820
Peas	104 010	167 775	184 775
Tomatoes	672 270	1 350 310	1 515 450
Other vegetables	43 050	69 035	63 545
Total vegetables	1 242 730	2 250 645	2 516 655

Nuts	*1900*	*1911*	*1912*
	tons	tons	tons
Almonds	2 740	1 450	3 000
Walnuts	5 430	12 500	9 250

Cured fruit	*1907*	*1911*	*1912*
	tons	tons	tons
Apples	3 300	3 500	3 500
Apricots	1 100	11 000	18 500
Figs	4 500	5 500	5 000
Peaches	15 500	14 000	27 000
Prunes	53 000	95 000	97 000
Raisins	75 000	65 000	85 000
Other	1 200	3 750	3 000

Wine	*1911*	*1912*
	gallons	gallons
Sherry	6 523 139	8 559 869
Port	9 164 671	9 522 238
Muscat	1 864 246	2 247 220
Angelica	2 123 824	2 609 519
Tokay	79 907	81 645
Malaga	337 503	327 173
Other sweet	136 835	119 782
Total sweet	20 230 125	23 467 446
Total dry and sweet	50 467 000	42 230 000

PLANT DISEASES

GENERAL INFORMATION.

EGISLATIVE
ND ADMINI-
RATIVE
EASURES
OR THE
ROTECTION
F PLANTS

421 - Legislation on Plant Diseases in the Colony of Mauritius.

KOENIG, P. — *Colony of Mauritius, Annual Report on the Forest and Gardens Department for* 1911, pp. 16-17. 1912.

In 1882, an Ordinance (No. 14 of 1882) was enacted in the Colony of Mauritius to prohibit or regulate the importation of vine plants or cuttings when affected or supposed to be affected with disease. The measure was passed at the request of the Government of the Colony of the Cape of Good Hope, to cooperate in prohibiting the importation of Phylloxera. No other legislation existed in Mauritius regulating the introduction of plants, fruits, manure, etc., except as regards protection from cattle plagues and animal diseases; against these the Medical and Health Department had been allowed a certain amount of control, chiefly after the outbreak of " Surra ", on importations of straw, animal manure and the like from countries where cattle plague was prevalent.

On the 30th June 1910, on the invitation of the Secretary of State for the Colonies, an Ordinance was enacted (No. 4 of 1910), to prevent the introduction into the Colony of diseases of plants. The law came into effect on the 19th of August 1911, by Proclamation No. 29, prohibiting the importation of certain produce like earth and leaf-mould, animal and vegetable manure, cattle fodder, timber with bark on, etc., and allowing the landing of other produce after inspection and treatment, if need be, by the Director of Forests and Gardens. It was advised to disinfect the suspected plants by means of fumes of hydrocyanic acid, but a fumigator has not yet been built. As a disinfectant, recourse has often been had to an emulsion of petroleum, soap and creoline.

During the service of inspection the presence was ascertained of *Hemichionsaspis aspidistrae* Sign., *Parlatoria proteus* Curt., *Mytilaspis pallida* Green on Citrus plants coming from China, Madagascar, etc., and of *Hemichionaspis minor* Mask. on pumpkins coming from the Rodriguez.

422 – The Regulation of November 12, 1912, for the Transport of Vegetables in Uruguay.

Reglamentación para el transporte de vegetales. — *Revista de la Asociación Rural del Uruguay*, Year XLI, No. 12, p. 921. Montevideo, 1912.

Art. 1. — No plant, or portion of a plant, can be transported in the territory of the Republic unless it is accompanied by the necessary certificate furnished by the "Defensa Agricola," or by the duly authorized proprietor, or official of the establishment from which it was despatched.

Art. 2. — The transport agents and railway officials must demand the certificate mentioned in Art. 1.

Art. 3. — Nursery gardeners and sellers of plants are obliged to request the examination of their products: if the results of the inspection show that the establishment is in a satisfactory sanitary condition, a certificate to this effect will be granted.

Art. 4. — This certificate will be valid for six months.

Art. 5. — The term fixed in the preceding article can be revoked any time that a subsequent inspection proves the existence of disease in the establishment, or whenever there is any infraction of the prescribed regulations.

Art. 6. — In every case where a new plant, or portion of a plant, which is being transported through the territory of the Republic is found to show symptoms of an infectious disease, all the responsibility falls upon the giver of the certificate mentioned in Art. 1.

Art. 7. — The amount of the penalty incurred is to be fixed for each case as it occurs, but shall not exceed the sum of £20.

Art. 8. — At least 10 days before the expiration of this certificate, the possessor is required to inform the General Direction of the "Defensa Agricola" of the fact.

Art. 9. — In the certificate mentioned in article 1 are to be specified the number and kind of products to be transported and the names and addresses of the sender and the receiver.

Art. 10. — The form of certificate is to be that appointed by the General Direction of the "Defensa Agricola."

423 – Order on the Control of Locusts in Spain.

Real orden disponiendo que por los Gobernadores civiles de las provincias que se mencionan se ordine à las Juntas locales de extinción de los pueblos invadidos por la langosta, la necessidad absoluta de que el dia 31 del actual se encuentren escarificados todos los terrenos que en sus respectivos términos esten acotados por contener germen de aquélla. — *Gaceta de Madrid*, Year CCLII, Vol. I, No. 16, p. 159. Madrid, January 16, 1913.

Art. 64 of the present law against the pests of agriculture (ley de Plagas del campo) of May 21, 1908, orders that the operations of cleaning the lands infested by locusts must be terminated by January 31. With the object of reminding the authorities that the law must be rigorously observed the present Order has been issued. It provides:

1) That the civil governors of the provinces of Albaceta, Avila, Ba-

dajoz, Cáceres, Cádiz, Canarias, Ciudad Real, Córdoba, Cuenca, Huelva, Jaén, Léon, Madrid, Málaga, Salamanca, Seville and Toledo shall inform the local commissions for the destruction of locusts in the rural districts affected by them, of the absolute necessity of ploughing not later than January 31 all the fields which in the various communes are considered to harbour locusts' eggs.

2) That the Chief Engineers of the respective agricultural districts shall within eight days supply information as to the number of acres already ploughed and of those still unbroken.

3) That the above Engineers shall give their opinion on the probable state of the invasion at the end of the autumn and winter campaign in order to forecast the intensity of the infection in the coming spring, and on the efficient remedies for its destruction.

4) That when the proportion of locusts that may hatch in spring is known, the above mentioned civil governors, with their respective provincial councils of agriculture (de Fomento), shall order the local commissions to draw up the estimates of the expenses, in the form set forth by articles 70 and 71 of the Law. Should the Minister of Agriculture (Fomento) lack the funds required for the control of this pest, the above Law provides the necessary subsidies.

5) The above Ministry will prosecute contraveners of the law, availing itself of all the means at its disposal.

DISEASES NOT DUE TO PARASITES AND OF UNNOWN ORIGIN.

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424 - The Infectious Chlorosis of Citrus Trees.

TRABUT. Sur la chlorose infectieuse des *Citrus*. — *Comptes-rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 1st Half-year, Vol. 56, No. 13, pp. 243-244. Paris, January 20, 1913

In orange-groves it sometimes happens that certain trees are attacked by a serious kind of chlorosis, which increases in intensity during the course of two or three years and causes the death of its victim. The chief characteristic of this form of chlorosis consists in its very clear transmission by grafting; for this reason the writer, who has already observed it for twelve years, suggests giving it the name of "infectious chlorosis". All slips taken from a diseased individual give rise to trees which are chlorotic from their second year; the stock itself becomes infected and dies from the same disease, even if the grafted portion is cut off. If this infected tree is grafted again, the disease spreads to the new graft.

According to the writer, two species of orange trees are especially liable to this malady: Washington Navel (coming from England, where it was grown under glass) and Siletta, of which grafts were sent from Australia; but it can make its appearance on other cultivated species of *Citrus*.

The diseased grafts grow vigorously the first year; in the second year they flower extraordinarily freely and bear an unusually heavy crop of fruit. Then the leaves begin to turn yellow along the midrib for a width of 3 to 5 mm. on either side. The discoloration afterward spreads to the lateral veins; the leaf has a peculiar appearance, the destruction of the chlorophyll continues, and soon the whole leaf loses its colour.

This disease, which seems not to have been described yet in America, is very similar to the "infectious chlorosis of the Malvaceae" of V. Baur (1906).

The writer states that in practice it is easy to prevent the trees contracting this malady, which he has proved by numerous experiments to be only communicable by grafting. As M. Trabut found no traces of bacteria, he admits for the present Baur's hypothesis, according to which the disease is caused by a phytotoxin secreted by an organism which has escaped microscopic investigations, but proves its presence by the inoculation results.

BACTERIAL AND FUNGOID DISEASES.

425 - The Contamination of the Soil by the Toxic Products of Parasitic Fungi.

FUNGI

PANTANELLI, E. Su l'inquinamento del terreno con sostanze nocive prodotte dai funghi parassiti delle piante. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali,* Vol. XXII, 1st Half-year, Part 2, pp. 116-120. Roma, 1913.

ID. Ancora sull' inquinamento del terreno con sostanze nocive prodotte da funghi parassiti delle piante. — *Ibidem,* part 3, pp. 170-174, fig. 1. Roma, 1913.

The aim of the writer was to discover if those fungi which attack the underground portions of plants under the natural conditions of parasitism can, during their lifetime, secrete sufficient toxic matter to permeate the soil and contaminate the latter for some distance from the part of the plant attacked, or whether these fungi leave toxic substances in the infected parts, even at their death, thus contaminating the soil for a certain length of time.

The first experiments were made in 1910; some sterilized wheat grains were germinated in contact with a raw or boiled infusion of *Septoria graminum* or with mould derived from wheat leaves attacked by this fungus, and also in contact with soil impregnated with the same unboiled infusion. Identical experiments were also carried out in 1910, with melon plants of which the crowns were infested by *Fusarium niveum* and with white mustard attacked by a species of *Pleospora*. An attempt was made, in the case of the mustard, to separate the toxic substances by precipitating the infusion with 30 to 45 per cent. alcohol. Similar experiments were made in 1911, when the base of the stem of beans attacked by *Sclerotinia Libertiana* and of lucerne infected with *Fusarium incarnatum* were selected.

The results were concordant and thus showed that soil, especially if it contains clay, can be impregnated with toxic products arising from the decomposition of vegetable organs infected by fungus parasites.

To avoid the objection raised, that by using entire infected organs in the previous experiments, it was impossible to be sure that the toxic matter was not derived from the cells of the host plant, pure cultures of *Sclerotinia Libertiana* were employed in 1911, and of *Fusarium incarnatum* in 1912; these were studied in connection with the germination of red clover and lucerne. In the case of the clover, the experiment clearly showed that the unboiled culture liquid (liquid gelatine) was much more injurious than mycelium juice (the mycelium was already old), and lost some of its toxic property on heating; 60 per cent. of its insoluble components were toxic; the volcanic sand (used as a substratum), being composed of coarse crystalline particles, did not absorb any of the toxic substances; while the loam soil retained the great portion of the latter in a form which was not accessible to the roots. The extremities of the roots were wilted, brown, or completely decomposed in some cultures, and had not been able to grow more than 263 mm. in length; in another culture, they were well developed where the seed had germinated deeply, but in seeds which had germinated at the surface they were withered and brown; this shows that the toxic substances remained in the upper layer of the soil. It appears, on the other hand, that the lucerne was stimulated by some substance present in the unboiled culture; but the boiled liquid slightly hindered germination. In any case, the roots of the first seeds which germinated were arrested in their development, and their extremities were discolored or destroyed in some of the cultures; the roots of the seeds last germinated were on the contrary quite healthy. This proves that the injurious substances had already undergone some change.

The effect of toxic preparations from *Sclerotinia Libertiana* was tried upon chickpea and lentil plants one month old grown on sterile volcanic sand. The mycelium juice produced no alterations; the neutralized unboiled culture liquid caused the death of the whole plant in one night, and if the liquid was heated to 100°C., the same effect was produced in two or three days.

In a second note the writer gives an account of similar esperiments to those made with a pure culture of *Scl. Libertiana*; these were carried out in 1912 with a culture of *Fusarium incarnatum* isolated from lucerne which was much damaged. This fungus also, according to the different experiments, elaborates toxic compounds of various kinds, amongst which, in the last analyses, volatile and stable nitrogenous bases predominated; these prevent the germination of the seeds and injure the roots of various Leguminosae.

It still remained to be seen whether these different fungi produce similar effects if the products are allowed to diffuse naturally in the soil. The first experiments made and carried out with suitable precautions with *Fus. niveum* on water-melons, *Scl. Libertiana* on beans and *Fus. incarnatum* on sainfoin and clover, proved that from the mycelia of these fungi and from their substratum, which under natural conditions would be the part of the plant attacked, toxic substances can permeate the neighbouring soil, so that they would hinder the growth of the roots, or prevent the germination of the seeds of similar plants.

426 - Researches on the Disease Caused by *Rhizoctonia violacea*.

ERIKSSON, JACOB. Études sur la maladie produite par la Rhizoctone violacée. — *Revue générale de Botanique*, Year 25, No. 289, pp. 14-30, figs. 1-4. Paris, 1913.

After a rapid review of the history of this disease and a description of its characteristics in Sweden, where it occurs especially on carrots and beets, the writer mentions, taking previous observations as a basis, that *Rhizoctonia violacea* attacks a large number of host plants, which are very varied from a systematic point of view. But in going into the matter more closely, it becomes clear that in a place where several species of plants are growing the disease does not attack all with the same intensity. This parasite has a certain tendency, though a slight one, to give rise to biological races. This can be proved (as was done by the writer during the summers of 1898 to 1902 and in the summer of 1911) by parallel inoculation experiments made with infections derived from different species of plants. By this means the writer was able to prove from two series of experiments, that the propagation of the disease by means of infectious matter derived from carrots and beets respectively was much easier and more effectual, if the subjects of the inoculation belonged to the same species as those which furnished the virus, and became increasingly difficult in the case of the other plants experimentad upon in the following order: *Stellaria media*, *Myosotis arvensis*, *Galeopsis Tetrahit*, *Erysimum cheiranthoides*, *Urtica dioica*, *Sonchius arvensis*, turnip, lucerne, potatoes; while others, such as clover and parsnip, are resistant to the infection.

Having recently re-examined the experimental material collected in 1898, Prof. Eriksson thinks (at least as far as the form of fungus attacking carrots is concerned) that the much debated question of the systematic position of the sterile mycelium known as *Rhizoctonia violacea* is now decided; its proper scientific name is *Hypochnus violaceus* (Tul.) Eriks. The fungus, during its vegetative period, forms upon the roots of many plants a felt-like mass of sterile mycelium, living as a parasite underground, of a reddish-violet colour and characterised by numerous confluent filaments which are septate and ramified. From this felt arise round sclerotia, dark brown in colour and resembling perithecia. This is the *Rhizoctonia* stage. Subsequently the fungus forms round the stems of the same plants, or of other species, and immediately above the soil, an annular membranous pale pink envelope, which often ascends the stems to a height of 5 to 15 mm., sometimes extending over the surface of the soil as a very thin sheet, and produces the basidiophores. This latter is the *Hypochnus* stage.

The name *Dauci* may be given temporarily to the species-form which has its *Rhizoctonia* stage on the bases of the stems of *Stellaria media*, *Myosotis arvensis*, *Galeopsis Tetrahit*, *Erysimum cheiranthoides*, *Urtica* *dioica* and *Sonchus arvensis*. Until further experiments and researches have been made, it is impossible to decide positively if the felted mycelium found on beets (*Rhizoctonia violacea* sp.-f. *Betae*), on clover, lucerne, etc., also possesses a *Hypochnus* form.

It is remarkable that the fruiting stage of the fungus (at least in the case of the sp.-f. *Dauci*) occurs on species of plants other than those infested by the sterile mycelium, and also that the fungus, which in the sterile stage is a pronounced parasite with much power of destruction, appears scarcely parasitic at all in its fruiting stage. The occurrence of the fruiting stage on species of plants other than those of the hosts of the sterile stage recalls the dioecious habit of many fungi of the rust family; in any case this *Hypochnus* stage requires further investigations.

In conclusion, the writer mentions the following methods for the control of the disease when it attacks carrots, beets and other roots:

a) At the time the crop is gathered, all stems showing the least trace of the disease should be destroyed, by cooking or otherwise.

b) The spots where diseased plants have grown should be marked by rings of sticks; the infected soil should then be treated with a fungicide, *e. g.* carbon disulphide (½ lb. in 10 gallons of water, 8 gallons being sufficient for 15 sq. yds.).

c) The roots which have been dug up from near the infected spots must be examined at intervals during the winter and all diseased ones destroyed.

d) A rotation of at least 4 years should be adopted, only such plants being cultivated as cannot possibly serve as hosts to the parasite.

e) The dung of animals fed on the contaminated roots must not be used as fresh manure.

427 - Researches on the Development and Control of Vine Mildew.

FABS, H. Sur quelques recherches concernant le développement et le traitement du Mildiou. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 99, pp. 161-165. Paris, February 1913.

It is well known that there is considerable difference of opinion amongst investigators as to the method of germination of the oospores of vine mildew (*Plasmopara viticola*) in spring. MM. Ch. Richon, Farlow and P. Viala believe that the oospores set free at a particular time zoospores which probably infect the vine in the same manner as the zoospores produced by the summer conidia. Others, M. Prillieux in particular, are of opinion that the oospores send out a germ-tube, which is modified later into a true conidiophore resembling the usual fructifications of the fungus which in summer project through the stomata of the leaf.

The writer, however, during the numerous researches and experiments which he made on the oospores of many vine leaves of the Chasselas variety gathered in the autumn of 1911, in no case saw any signs of a germ-tube, and was never able to infect the upper or lower surfaces of the leaves by means of oospores. The solution of the question necessitates further research, but the writer does not think that the oospores can at all readly germinate in spring and infect the vine.

During the summer of 1912, M. Faes made some further experiments on the infection of vine leaves and bunches of grapes by mildew conidia. As far as the former were concerned, these experiments confirmed his previous observations : the germ-tube issues from the zoospore and penetrates into the interior of the leaf by means of the stomata on its lower surface.

In the case of the bunches, the infection of the buds takes place by means of the stomata on the upper part of the petals. The writer obtained negative results in attempting to infect the flowers after the fall of the corolla. Grapes of the size of a pea could only be infected when the conidia were placed on the point of insertion of the pedicel in the grape, or on the pedicel itself.

In conclusion, the writer mentions that in 1912, all vines which were well-tended and sulphured were immune from the attacks of mildew. Comparative experiments proved that sulphuring the lower surface of the leaf in all cases protected the vines as well as sulphuring the upper surface. This subject, however, needs further investigation.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

428 - *Sterigmatocystis nigra* damaging Tobacco in Hungary.

RAPAICS, RAYMUND. A dohány kormos rothadása. — *Magyar Dohanyujság*, Year XXX, No. 4, pp. 2-4. Budapest, February 20, 1913.

During the last two years, a fungus disease which had not been recorded from other countries in Europe has been causing havoc in Hungary. The fungus is *Sterigmatocystis nigra*, known only in North America, where it is called canker or black rot. It attacks tobacco during the fermentation and decomposes the leaves, reducing them to a black powder.

In 1911, M. Étienne Uray, controller of the purchase of tobacco at Budapest, when buying tobacco for the Royal Excise Office of Hungary, discovered for the first time *Sterigmatocystis nigra* on the leaves. Subsequently the Experimental Station of Tobacco Cultivation at Debreczen made a chemical examination of the material and stated that this was the first time that the fungus had been observed to attack tobacco in Hungary. This new disease is the more dangerous in that the cause of the appearance of the parasite on fermenting tobacco leaves is not known, although the same fungus has been met with upon other decomposing substances.

The writer gives some information on the nature of the disease, and considers that the black powdery decomposition product of the leaves which are attacked is directly due to the fungus. No efficacious remedy has so far been discovered.

429 - A Disease of Tomatoes (1).

BROOKS, F. T. and PRIOR, S. R. in *The New Phytologist*, Vol. XII, No. 1, pp. 13-21 + 13 figs. London, January 31, 1913.

In October 1911 some tomatoes grown out of doors in the neighbourhood of Bristol were found to bear large diseased areas somewhat depressed below the surface of the healthy parts. On the diseased portions of the fruits were found a species of *Cladosporium*, a species of *Macrosporium* and a fungus with pycnidial fructifications. These fungi were, for the most part, indiscriminately mixed, but on some of the diseased areas most recently formed, only the fungus bearing pycnidia could be seen. It was thought, therefore, as was proved experimentally, that the latter fungus was the cause of the disease, the two others being merely saprophytes. At a later date, the same pycnidia-bearing fungus was found on tomatoes grown under glass in the neighbourhood of Cambridge and was observed for two seasons in succession on plots of out-door tomatoes; in the latter cases the lower part of the stem was the region attacked, the cortex being partially destroyed by the parasite, which was identified as *Ascochyta citrullina* C.O. Smith, the conidial form of *Mycosphaerella citrullina* Grossenbacher. The writers cultivated the fungus isolated from the fruit and the stem, and made inoculation experiments with the parasite obtained from the fruit and stem of the plant.

In one plot of out-door tomato plants in Cambridgeshire, the disease occurred two years in succession and, in view of the apparent absence of a perithecial stage in Great Britain, and of the fact that the tomato plant is an annual, it is not clear how the disease is propagated from one year to another. It is possible that the mycelium hibernates in the dead tissues of the affected plants and that portions of diseased plants, left on the ground instead of being burnt, are the means of reinfection, if the same plot is planted the following year. The disease attacked the out-door plants when they were nearly full-grown, and under these conditions was sporadic, only 3 per cent. of the plants being affected; there is therefore little fear of its becoming a serious pest to growers of out-door tomatoes. Massee has, however, pointed out that this fungus may cause a serious epidemic among greenhouse tomatoes.

In consequence of its virulence under these conditions, it is included in the list of pests scheduled by the Board of Agriculture under the "Destructive Insects and Pests Act".

430 - *Botrytis cinerea.*

LAFFORGUE, G. Le *Botrytis cinerea*. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 245-254. Paris, February 20, 1913.

A general study of this now dangerous parasite of the vine. The writer deals with the biology, the effects ("Edelfäule", "pourriture grise") of *Botrytis* on grapes and states that the control methods hitherto adopted for the control of this fungus are inefficacious. Further researches are necessary.

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(1) See also No. 1546, *B*. May 1911. (*Ed.*).

431 – *Uromyces hyalosporus* sp. nov., causing the Disease to the Shoots of *Acacia confusa* Merrill.

SAWADA KANEYOSHI in: *The Botanical Magazine*, Vol. XXVII, No. 313, pp. 16-20, 1 fig. Tokyo, January 1913.

The " Sòshiju ", *Acacia confusa* Merrill, is one of the most useful trees in Formosa, where it is used for avenues and ornamental purposes; it also furnishes fuel and timber and is planted as a windbreak. Throughout the island there are nurseries of this tree, which is everywhere employed in the extensive afforestations. The young trees in the nurseries are, however, much attacked by a rust-fungus; this especially injures their shoots. When the latter are badly affected uredo-sori occur in great numbers (even as many as 50) on a phyllode; they often coalesce, forming large patches, and deform phyllodes and young twigs; the growth of these is hindered and death subsequently ensues. On large trees, both pods and phyllodes are usually affected.

The writer gives a detailed description of the agent of the disease, and as he considers it to be a new species, he proposes it shall be known as *Uromyces hyalosporus*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

432 – On the Behaviour of the Seeds of Wild Plants in the Soil and the Poor Results in the Destruction of Weeds obtained by Cultivation.

MUNERATI, O. Sul comportamento dei semi delle piante spontanee nel terreno e sulla scarsa efficacia dei lavori del suolo per provocare la distruzione delle erbe infestanti. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, First Half-year, Part 2, pp. 120-126. Rome, 1913.

The age of the seed has certainly much to do with the preservation of species. The writer observed, in the lower Valley of the Po, that within certain limits, most weed seeds germinate more rapidly the longer the time which has elapsed beeween the time of their ripening (and consequently of their falling to the ground) and the date at which their germinating power is tested. There are in every case some hard seeds, even when they are two years old and more. As a rule, it can be stated that the less rapidly the seed becomes ready to germinate, the more persistent is the species as a weed.

The seeds of leguminous weeds do not appear as a general rule to benefit by a variation in humidity, and other seeds remain indifferent; but there are certain species, such as false oat (*Avena fatua*), shepherd's purse (*Capsella Bursa-pastoris*), dock (*Rumex crispus*), sage (*Salvia pratensis*), in which the germination of the seeds is greatly stimulated by alternations of damp and dryness. It is thus erroneous to judge of the behaviour of seeds in their natural habitat by their conduct in the germinator.

Even in years when the summers are very wet, the seedlings do not come up in much greater numbers than in dry years.

It is generally believed that seeds which are buried deeply by ploughing can preserve their vitality indefinitely. The writer has ascertained, by means of a series of experiments, that, at least in soil which was worked periodically, seeds buried 14 to 18 inches deep (the usual ploughing depth in breaking up the temporary pasture) were under as good germinating conditions as if they had been lightly covered with soil. Should these deeply-buried seeds not germinate, this is probably due to the fact that they would not have germinated even in the most superficial layer of the soil.

From these data the writer deduces:

1. Superficial working of the ground (including work which is done in summer after harvest) is of very little use in controlling weeds which are propagated by seed, (*a*) because a large number of seeds do not grow, even if they happen to be in the superficial layers of the soil, and are periodically exposed to light showers which keep the ground continually, or only intermittently, damp; (*b*) because seeds which are ready to germinate come up equally well if they are buried deep in ploughing.

2. The very frequent turning over of the cultivable layer of soil is for the same reasons of little use, for even where the working of the soil is the main feature of modern agriculture, weed control has not ceased to be of the greatest difficulty.

3. The practice of preventing weeds from ripening their seeds and letting them fall to the ground should not be regarded as one of many means of hindering the propagation of the most harmful species, but as the sole certain and efficacious method, besides being the most economical.

433 - Noxious Weeds: The Canary Island Broom (*Cytisus canariensis* Steudel) in Tasmania.

BLACK, R. A. in *The Agricultural Gazette of Tasmania*, Vol. XX, No. 12, pp. 488-490 + 1 fig. Hobart, December 1912.

This leguminous plant is a native of the Canary Islands, where it is used, *e. g.* at Santa Cruz, as a hedge or garden plant. It grows in many parts of Tasmania and when left undisturbed soon takes possession of the land. It has already become a nuisance in Victoria, where it has been proclaimed a noxious plant in at least twelve districts.

The writer recommends that this plant should be prevented from spreading by pulling it up and burning it before it goes to seed.

Prof. Ewart points out that the foliage of this *Cytisus* appears to be slightly poisonous.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

434 - The Simultaneous Destruction of *Colaspidema atra* and Lucerne Dodder by Calcium Cyanamide.

SOLANET, L.-E. *Destruction simultanée du Négril et de la Cuscute des Luzernes*, 30 pp. Montpellier (n. d.).

A succinct account of experiments made on a large scale, during four consecutive years, in the neighbourhood of Montpellier for the purpose of destroying simultaneously *Colaspidema atra* (1) and lucerne dodder, The author states that calcium cyanamide reduced to as fine and light a powder as possible and applied annually at the rate of 90 lbs. per acre, has so far proved to be the most efficacious remedy against both the beetle and parasitie plant, while at the same time, it in no wise interferes with the growth of the lucerne. As this small amount of cyanamide is difficult to spread uniformly, the writer suggests mixing it with other substances according to the following formula: cyanamide, 1 part; gypsum, two parts; wood ashes, 1 part.

435 - The Control of *Conchylis* in Switzerland in 1912.

FAES, H. La lutte contre le ver de la vigne (Cochylis) en 1912. — *La terre Vaudoise*, Year 5, No. 7, pp. 67-69. Lausanne, February 15, 1913.

In 1912, owing to the unfavourable weather of the previous year, there was a relatively slight development of *Conchylis ambiguella*. But on the other hand, *Polychrosis botrana*, which was introduced into Switzerland also with imported grapes, spread there very much.

The writer gives an account of his experiments in the control of the latter pest in the vine-growing districts of Yvorne. Nicotine (2) added to a copper wash (20 lbs. per 100 gallons) or to a solution of soft soap (20 lbs. nicotine and 20 lbs. soap per 100 gallons) gave encouraging, if not wholly satisfactory, results; the experiments will be repeated in 1913. Creosote did not prove efficacious. Amongst the various insecticides tried ("insecticide X°X", "Golaz", "Palaccio", "Glucine" and "poudre Milo"), the first of which the composition is a secret, gave more interesting results and will be used for further experiments.

In order to increase the already potent effects of treatments with a base of pyrethrum powder and soft soap, the writer made mixtures of soft soap, pyrethrum powder and nicotine, and of soft soap, pyrethrum powder and lysol, which he is going to test in the open.

In 1912, both in the laboratory and the vineyard, the writer had excellent results with a solution of soft soap and pyrethrum powder (water 100 gallons, soft soap 20 lbs.; pyrethrum powder 15 lbs). The remedy should be applied in cloudy weather, or any way at night, to the larvae while still very small (2 to 3 mm. = $\frac{1}{10}$ inch.). The best pyrethrum powder is furnished by *Chrysanthemum cinerariaefolium*; the flower heads should be gathered before flowering, dried and pulverised. With a view to the possible cultivation of this pyrethrum in the warmer parts of Switzerland, and thus obtaining the powder pure and fresh, M. Faes began, in the spring of 1912, making trials of sowing and transplanting in three different districts, using seed from various localities.

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(1) A Chrysomelid very injurious to lucerne in France, especially in the south. G. GUÉNAUX: *Entomologie et Parasitologie Agricoles* (*Encyclopédie Agricole*), p. 161. (*Ed.*).

(2) Probably tobacco juice containing 10 per cent. of nicotine. (*Ed.*).

436 - The Destruction of the Larvae of *Conchylis* and Aphides on Fruit Trees.

PETIT, A. Destruction des larves de la Cochylis et des Pucerons ordinaires. — *Journal de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, November 1912, p. 710. Paris, 1912.

The writer states that a simple aqueous solution of white soap, without the addition of any toxic substance, but made in the proportion of *at least* 10 lbs. per 100 gallons of *rainwater* is sufficient to destroy *Conchylis* larvae. The amount of soap must be increased as required should the water be hard. The solution should be applied only to the bunches of grapes and a sprayer must be used.

Further, a solution of 4 lbs. of Marseilles soap in 100 gallons of rain-water destroys, according to the writer, the aphides which commonly attack fruit trees.

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URIOUS
VARIOUS
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437 - Enemies of Barley.

NOEL, PAUL. Les ennemis de l'Orge. — *Bulletin du Laboratoire régional d'Entomologie agricole*, Fourth quarter (Oct.-Nov.-Dec.) 1912, pp. 5-7. Rouen, 1912.

List of the enemies of this cereal.

Coleoptera : *Melolontha vulgaris* L., *Agriotes lineatus* L., *Sitophilus* (*Calandra*) *oryzae* Fb., *Lema cyanella* L., *L. melanopa* Hbst.

Hemiptera : *Aphis cerealis* Kalt., *A. avenae* Fb., *Jassus sexnotatus* Flor., *Endeis* (*Aphis*) *bella* Koch.

Lepidoptera : *Agrotis crassa* Fb., *A. clavis* Rott., *Charaeas graminis* L., *Asopia farinalis* L., *Orobena frumentalis* L., *Gelechia cerealella* Oliv.

Diptera : *Phytomyza cinereifrons* Hardy, *Chlorops taeniopus* Meig., *Cecidomyia destructor* Say, *C. flava* Meig., an undetermined Cecidomyid, and *Oscinis tritici* Fb., L.

Nematoda : *Tylenchus devastator* Kühn.

Fungi : *Ustilago Jensenii*, Rostr., *Erysiphe graminis* D C., *Puccinia graminis* Pers, *Helminthosporium gramineum* Eriks.

438 - Cotton Pests in the West Indies.

BALLAU, H. A. Notes on Certain Cotton Pests. — *West Indian Bulletin*, Vol. XIII, No. 1, pp. 34-38. Barbados, 1912.

The flower-bud maggot (*Contarinia gossypii* Felt.) made its appearance in Antigua about the end of 1907, and in 1907-08 destroyed about half of the cotton crop. From 1910 to 1912 it did no damage or very little.

The eggs of the flower-but maggot are not known, but it is believed that they are deposited within the tissues of the flower bud, the maggots feeding on the stamens and pistils. As many as 43 maggots have been counted in one bud. When the attacked bud drops, the maggots make their way into the ground, where they pass the pupal stage and transform to the adult condition. The entire life-cycle probably occupies from 24 to 31 days. This insect has been reared from cultivated cotton, from wild or native cotton, and from wild coffee (*Clerodendron aculeatum*). Insecticides and direct remedial measures have given negative results. The occurrence of the flower-bud maggot seems to be associated with periods of more than ordinary dampness accompanied with cool nights, which conditions occur in Antigua towards the end of October. Therefore early planting has been advised.

During the last few seasons there has been a remarkable decrease in numbers of the cotton worm (*Alabama argillacea*), due to the action of natural enemies. The following species are known in the West Indies: — Egg parasites: *Trichogramma pretiosa* and *Telenomus* sp.; parasites of the larvae or of the pupae: the "fleshy fly" (*Sarcophaga trivittata*), Tachinid flies, *Chalcis annulata*; predaceous insects: *Polistes annularis* (called "Jack Spaniard" in St. Vincent and "wild bee" in the Barbados), *P. bellicosus* ("cow bee"), *P. fuscatus instabilis* ("Marabunta" or "Jack Spaniard"), *Calosoma calidum* ("fiery ground beetle"), etc., and insectivorous birds, the most useful being the Barbados Blackbird (*Quiscalus fortirostris*).

The black scale (*Saissetia nigra* Nietn.) was one of the most serious pests of cotton in Barbados in 1905-06 and in 1907-08. Since this time it has been almost harmless, apparently as a result of the enormous development of an insect parasite, *Zalophothrix mirum* Crawford. This is also parasitic on *Saissetia hemisphaerica, S. oleae, Ceroplastes*, etc. Good results have been obtained by collecting twigs of *Hibiscus* or other plants bearing parasitized scales and tying them to the branches of cotton plants attacked by the scale insect. The shield scale fungus (*Cephalosporium Lecanii*) is also a powerful destructive agent of the black scale, especially during the wet season.

439 - *Heliothrips phaseoli* sp. nov., Injurious to Beans in Texas.

HOOD, J. DOUGLAS. A New Genus and Three New Species of North American Thysanoptera. — *Psyche: a Journal of Entomology*, Vol. XIX, No. 4, pp. 113-118, plates 8 and 9. Boston, Mass., 1912.

A description is given of a new species of thrips (*Heliothrips phaseoli* sp. nov.), collected by Mr. C. A. Hart near Brownsville, Texas, where it was very injurious to beans in 1908. The beans became yellowish and the crop was greatly diminished. It was also found on a wild bean in Mexico, so that it is supposed that it is a native insect which has lately turned its attention to cultivated beans.

440 – *Hypolycaena philippus*, an Enemy of Pineapples at Sao Paulo (Brasil).

BONDAR, GREGORIO. Una praga do abacaxi (Estudo original). — *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year I, No. 4, pp. 103-104 + coloured plate. Rio de Janeiro, 1912.

At Campinas (Saõ Paulo) the young and well developed fruits of *Bromelia Ananas* L. (*Ananas sativus* Schult), called "abacaxi" and "ananaz" in Brazil, are much injured by the larvae of *Hypolycaena philippus* Fabr., a butterfly of the family *Lycaenidae* (blues). The exterior of the fruits, while still attached to the plants, is deformed and there are blackish cavities inside (which greatly spoil the appearance and depreciate the value of the pineapples) made by the larvae; these perforate the fruit in order to reach the interior, where they live on the pulp and eject their excrement through the holes they have made; this collects on the surface in the form of soft white masses, which are easily distinguished from the gum which accumulates at times on the fruits. When once the fruits are attacked, they rot, or grow deformed; generally two cavities in a fruit are sufficient to render it useless.

Pineapple cultivation being an industry of great importance in Brazil, the spread of this pest might be very harmful. In order to prevent its propagation, the writer counsels the inspection of the plants, in November or December, preferably in the morning when the excrement of the larvae is fresh and more visible, and the following up of the existing hole in order to capture and destroy the invaders.

RUGGERI ALFREDO, *gerente-responsabile*.

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of March and April 1915.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Administrative Measures taken in Holland in Favour of Cattle Breeding

by

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Whilst the measures adopted by the governments to further the breeding of horses are regulated by a special law (Law of 1901 on horse breeding), it is not the same with those for cattle.

Already in 1809, under king Louis Napoleon, a law was enacted on the selection of bulls which forbade putting at the disposal of the public non-approved bulls, but it was not applied on account of the troublous times then prevailing. After the reestablishment of the independence of the country, ordinances were issued by the various provinces, with the encouragement of the Government, on the selection of bulls, but they were gradually abrogated because it was thought that the improvement of cattle might be safely entrusted to the farmers themselves.

Under the influence of the agricultural crisis which was felt in Holland at the end of the nineteenth century, a change in public opinion took place by degrees, and the Governement was urged to abandon its passive attitude and to take in hand the agricultural interests.

Several provincial administrations had already set the example. Thus North Brabant had re-introduced the compulsory approvation of bulls, with a system of bounties; the province of Limburg followed this example in 1890. The other provinces placed at the disposal of the administration subsidies to be granted to the best bulls. These precedents induced the Central Government to appropriate a sum of 30 000 florins (£ 2 500) in the 1897 budget, for the encouragement of cattle breeding. Since then the above sum has been gradually increased.

At present the budget of the State includes every year appropriations for the following objects:

a) **Grants to associations possessing a herd-book.**

b) **Grants to provincial commissions for the improvement of cattle.**

c) Nomination of experts in the matter of breeding.
d) Institution of courses for the improvement of stables.
e) Subsidies to national shows.

A. *The Herdbooks in Holland.*

There are two great associations in Holland which possess herdbooks; one is that of the Netherland Cattle Herdbook (Nederlandsch Rundveestamboek), and the other that of the Friesian Herdbook (Friesch Rundveestamboek). They receive every year from the Government grants of 15 000 florins (£ 1 250) and 7 000 florins (£ 583) respectively. There are also two other less important associations having mostly local interest and which are not in receipt of Government grants.

The Netherland Cattle Herdbook dates back from 1873; it includes the three following: The Black-and-White Holland breed, the Brown-and-White Yssel and the Black-Whitehead Groningen. To a certain extent this Herdbook may be considered as the fusion of three separate herdbooks. A General Direction at the Hague issues the regulations to be followed by the three herdbooks. This federation aims at favouring the creation of breeding associations, by giving them the possibility of registering in the herdbook, obliging them at the same time to submit their statutes, regulations and instructions for the keepers of the bulls and for the milk control assistants to the approval of the directors of the herdbook.

At the end of 1912, fifteen associations formed part of the Netherland Cattle Herdbook, and there is every reason to believe that this number will increase considerably in the future.

The Friesian Herdbook dates from 1879. It deals only with Friesian cattle, and registers only the Black-and-White and Brown-and-White Friesian animals. The Friesian Herdbook Association works in intimate touch with the provincial commission for the improvement of cattle. The central examinations of bulls are carried out by the Friesian Herdbook Association. The surveillance of the work of the milk control assistants, of the breeders'associations and of the control associations is effected by the Control Commission of the Friesian Herdbook Association, in which the milk expert of the province has a seat.

In order to be entitled to a grant the bulls must be registered in the herdbook.

The registers of the herdbook already contain 4151 bulls and 12 993 cows, or a total of 17 144 head. In the printed herdbook, the performances of the 6 500 cows under milk control are given; 31 Friesian breeders appear as having all their cattle registered in the herdbook.

B. *Bounties granted by the Central Government to the Provincial Commissions for the Improvement of Cattle Breeding.*

The manner of using the government and provincial grants is settled by the « Regulation on government subsidies for cattle breeding ». The first regulation was issued in 1897; the grants were at first exclusively devoted to the awarding of prizes for bulls. But the opinion steadily gained ground that it was not enough to bestow prizes only on bulls, but that the cows also should be taken into consideration. The most practical manner of attaining this object was to encourage the spirit of association among breeders, which gives rise to breeding associations, to associations for buying breeding animals in common, and to control associations. These considerations led to a modification of the general regulations which was effected in 1907.

At present in each of the eleven Dutch provinces the members of the Permanent Commission of the Provincial States appoint a commission for the improvement of cattle, after having consulted the agricultural associations of the province and the herdbook associations designated by the Minister of Agriculture, Industry and Commerce. The cattle expert, the milk expert and the provincial professor of agriculture have seats in this commission as advisers, but do not vote.

These provincial commissions have to draw up a regulation for the distribution of the government and provincial grants and bounties, to appoint one or more examining commissions, and to administrate and distribute the sums devoted to grants and bounties.

The Minister of Agriculture, Industry and Commerce appoints one member to each of these commissions.

Every year before the 1st of March the provincial commission sends to the Minister: *a*) a statement of the sums placed at its disposal by the Government; *b*) a brief report giving an exact statement of the condition of cattle breeding in the province during the past year; *c*) a proposed budget for grants and bounties to be approved by the Minister.

At first the government and provincial grants were almost exclusively devoted to making up bounties for bulls, which were awarded according to their external characters, but gradually their pedigree and the quality of their offspring were taken into account.

In 1911 the provincial commissions received from the government and from the provinces the following grants.

Provinces	Government grants			Provincial grants		
	£	*s*	*d*	£	*s*	*d*
Groningen	258	6	8	208	6	8
Friesland	529	3	4	460	0	0
Drenthe	333	6	8	166	13	4
Overyssel	368	6	8	125	0	0
Guelders	500	0	0	1000	0	0
Utrecht	370	16	8	375	0	0
North Holland	500	0	0	416	13	4
South Holland	491	13	4	607	1	8
Zealand	250	0	0	250	0	0
North Brabant	366	13	4	625	0	0
Limburg	258	6	8	166	13	4
Total	£ 4226	13	4	£ 4400	8	4

About 60 000 florins (£ 5 000), or about two-thirds of the total sum placed at the disposal of the provincial commissions by the government and the provinces, were distributed as bounties for the bulls presented to the examination commission. These examinations are divided into local, district and central examinations.

The local examinations precede the district examinations; they are held in localities easily accessible to breeders, and in them the animals which may compete for the district bounties are picked out. The central examinations are held in several provinces and concern the animals that have recived bounties in the district examinations. They form at the same time markets for breeding animals and as such are highly appreciated by farmers.

Certain provinces (Groningen, Utrecht and Drenthe) award bounties to cows also, but these examinations of cows have not yet developed much, because it has been understood that the object was better attained by subsidizing the breeding associations. Accordingly the activity of the provincial commissions was more and more directed to the development of the spirit of association among breeders, and this movement is unceasingly spreading. The mode of distributing the grants varies from one province to another. In some places a fixed yearly sum is allotted, in others the grant consists especially of high bounties for the association bull.

The control of the subventioned associations for the purchase in common of breeding animals follows certain fixed regulations, which deal with the milk control of the cows registered in the books of the breeding associations, the manner of keeping the pedigree books, the declaration of the birth of the calves and the care of the bulls.

In Friesland, where cattle breeding is highly developed, there are only five breeding associations, and the whole of the province may be considered as one great breeding association, having as a central register the Friesian Herdbook.

In this province the milk control is effected by assistants who depend from the cooperative dairies.

In the other provinces this control is entrusted to special assistants, and the dairy experts play a very important part, both in instructing the assistants and in controlling their work.

The Netherland Herdbook assists also as much as possible in the formation of breeding associations, by admitting well constituted associations and affording them pecuniary and moral assistance.

In five provinces (North Holland, South Holland, Friesland, Zealand and North Brabant) the breeding and the control associations have grouped themselves into provincial federations having special statutes and a council of management, the members of which are elected by the federated associations among their members.

The associations for the purchase in common of breeding animals and the control and breeding associations at present existing are the following:

	Associations for the purchase in common of breeding animals	Control associations	Breeding associations
North Brabant .	4	—	23
Guelders . . .	23	5	31
South Holland .	8	—	27
North Holland .	—	—	23
Zealand	21	12	—
Utrecht	—	4	15
Friesland. . . .	56	90	5
Overyssel. . . .	19	2	10
Groningen . . .	—	3	7
Drenthe	43	—	5
Limburg	43	—	2
Total	217	116	148

C. *Breeding Experts, Dairy Experts, Government Professors of Agriculture.*

In each of the 11 provinces there is a professor of agriculture and a dairy expert appointed by the Government; in three of the provinces there are also breeding experts. Breeders owe a good deal to the influence of these officials, who have taken a special interest in the organisation of agricultural and breeding associations and who have contributed by their zeal to the foundation of a great number of associations for the purchase in common of breeding animals and of others for control and for breeding.

The milk control has been greatly facilitated by the support of the dairy experts, who, thanks to their courses on the examination of milk, have formed a competent staff for milk control and breeding associations ; besides which they have freely opened their laboratories for the examination of milk. But as their task was a heavy one, the Government recognized the necessity of appointing special officials or breeding experts who could devote themselves wholly to the improvement of cattle. The two first breeding experts were appointed in 1908 and the Government proposes increasing their number as soon as capable officials can be formed.

D. *Stable Competitions.*

Thanks to the cooperation of the dairy and breeding experts, the agricultural associations and the cooperative dairies organize every year competitions for the improvement of stables. There are at present in the various provinces special commissions which manage and watch over these competitions. They are compesed of some practical farmers, of one or more of the above- mentioned officials, sometimes of a veterinary surgeon and of a representative of the institute for agricultural machinery and rural costructions attached to the Higher School of Agriculture, Horticulture and Forestry of Wageningen.

Most of these stable competitions are subventioned by the Government and are subject to special regulations. They have been very useful, especially in backward districts, as they have materially assisted in bringing about such improvements as were necessary from a hygienic point of view, and indispensable for obtaining a good production of milk.

E. *Live Stock Census.*

The Government makes a census of live stock at determined dates. The last was taken between May 20 and June 10, 1910. It showed that there were then in Holland 2 026 943 head of cattle against 1 690 463 in December 1904, namely an increase of 336 480, or 20 per cent.

The cattle are distributed as follows in the various provinces:

Number of cattle per 100 acres of arable land, pastures and gardens	
1. Utrecht	55.8
2. S. Holland	51.4
3. Friesland	46.1
4. N. Holland	41.7
5. Guelders	39.3
6. Overyssel	37.2
7. Limburg	32.8
8. Drenthe	32.8
9. N. Brabant	32.4
10. Zealand	22.7
11. Groningen	22.3
General average	38

Number of cattle per 1000 inhabitants		
Friesland	845	head
Drenthe	556	»
Overyssel	476	»
Utrecht	459	»
Guelders	443	»
N. Brabant	364	»
Zealand	363	»
Groningen	322	»
Limburg	314	»
S. Holland	222	»
N. Holland	185	»
General average	348	head

F. *Measure adopted to favour the Exportation of Cattle.*

In order to afford foreign importers of Dutch cattle the greatest security as to the sanitary conditions of the cattle intended for exportation, the Government issued on September 11, 1908, a Royal decree dealing with the examination by a veterinary surgeon of breeding cattle intended for exportation. The veterinary delivers a certificate which declares that the animals are free from any contagious disease. The chief of this inspection service, which includes examination for tuberculosis also, is the Director of the Rotterdam Government Institute for the preparation of serums. The veterinaries entrusted with the inspection are expressely appointed by the Government.

Belgium is the country which purchases the greatest number of cattle from Holland (mostly animals for the butcher, but also milch-cows). Germany and England do not allow the importation of live animals, but the exportation of the meat for those countries is very considerable. The demand from abroad for Dutch breeding cattle is always increasing: they are exported at high prices to Italy, Spain, Portugal, France, Austria, Galicia, Russia, Sweden and also to South Africa, Brazil and Japan.

Of late years the foot-and-mouth epidemics have rendered exportation much more difficult. In 1909, a year which may be considered as normal, the exportation of live cattle was about 109 000 head.

G. *Shows.*

Every year agricultural shows, at which cattle occupy an important position, are held in Holland. They are frequently organized by agricultural associations and have a provincial or rather local character.

It is proposed now to hold at fixed dates agricultural exhibitions which will be organised by the Royal Netherlands Agricultural Society. They will not only give an idea of the various branches of agriculture in Holland, but will also serve purposes of demonstration and education.

The first great national show of this year will be held at the Hague from September 13 to 16. It promises to be very interesting, and it will receive from the Government an appropriation of £ 25 000.

The Poultry Industry in Great Britain

by

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To voluntary effort must be mainly attributed the great development made in respect of the Poultry Industry within recent years, rather than to the support accorded by State and local authorities. The time has arrived, however, when the last named are undertaking responsibilities for promotion, teaching and organisation of Poultry-keeping as an economic pursuit, which may profoundly affect future production, equally as to quality and volume. It is now recognised that instruction, investigation, research and organisation are public services that cannot be left to the initiative of individuals or private bodies, more especially as those to whom we must look for increased production are mainly smaller farmers and occupiers. As evidence of this fact may be cited the relative number of poultry kept per 100 acres of cultivated land in 1908 in relation to the size of holding, as published by the Board of Agriculture and Fisheries, the result of a Census taken in the year named.

Area						No. of Poultry	
Above	1 acre	and not	exceeding	5 acres		1 041	per 100 acres.
»	5	»	»	50	»	272	»
»	50	»	»	300	«	88	»
»	300 acres.					42	»

Thus the farmers under five acres had *pro rata* to the size of their holdings 25 head of poultry for every one on farms of 300 acres and upwards. Such is a very suggestive fact, one which explains why a much greater production is looked for where small holdings at present exist or increase in number.

The last poultry census referred to above was taken in June, 1908, and the total figures published include both old and young birds. The totals given are as in Table I.

TABLE I.

No. of Poultry in Great Britain (1908) *and Comparisons per Thousand Acres of Cultivated Land.*

Country	Fowls		Ducks		Geese		Turkeys		All Poultry	
	Number	Averages	Number	Averages	Number	Averages	Number	Averages	Number	Averages
England . .	25 962 000	1 057.0	2 395 000	97.5	494 000	20.1	541 000	22.0	29 392 000	1 196.7
Wales . . .	2 287 000	820.5	274 000	98.3	192 000	68.8	87 000	31.2	2 840 000	1 019.0
Scotland . .	4 107 000	844.5	294 000	60.4	26 000	5.3	69 000	14.2	4 496 000	924.5
Great Britain	32 356 000	1 004.0	2 963 000	91.9	712 000	22.1	697 000	21.6	36 728 000	1 139.8

The above figures for Great Britain include the Islands unenumerated in the countries.

The true basis, however, is the number of adult stock, as these represent the breeders. In Table II are shown the divisions of Great Britain and the percentages of each class of poultry per 1000 acres of cultivated land.

TABLE II.

Number of Adult Poultry (1908) *with Averages per Thousand Acres of Cultivated Land.*

Divisions	Fowls		Ducks		Geese		Turkeys	
	Number	Averages	Number	Averages	Number	Averages	Number	Averages
I*a* Eastern	1 517 000	516.7	75 000	25.5	13 000	4.4	24 000	8.2
I*b* North-Eastern .	1 673 000	512.2	95 000	26.0	14 000	4.3	21 000	6.4
II*a* South-Eastern .	1 467 000	540.7	76 000	28.0	15 000	5.5	12 000	4.4
II*b* East-Midland . .	1 485 000	518.2	68 000	23.7	13 000	4.5	13 000	4.5
III*a* West-Midland .	1 568 000	491.1	126 000	39.4	32 000	10.0	24 000	7.5
III*b* South-Western.	1 698 000	538.4	110 000	34.8	28 000	8.8	25 000	7.9
IV*a* Northern . . .	1 873 000	587.1	62 000	19.4	23 000	7.2	11 000	3.4
IV*b* North-Western.	2 493 000	769.3	129 000	39.8	34 000	10.5	16 000	4.9
Total-England . . .	13 774 000	560.8	741 000	30.1	172 000	7.0	146 000	5.9
Wales	1 240 000	444.8	103 000	36.9	69 000	24.7	26 000	8.9
Scotland . .	2 429 000	499.4	185 000	38.0	12 000	2.4	27 000	5.5
Great Britain . . .	17 443 000	538.4	1 029 000	31.9	253 000	7.8	199 000	6.1

The distribution is shown in the tables. These figures do not, however, include any occupations under an acre in extent, and, therefore, all the poultry kept by cottagers and others in rural districts and by private residents in urban and suburban areas are additional. In many manufacturing and mining centres the number of fowls kept by these smaller poultry-keepers is several times greater than on the neighbouring farms. A conservative estimate is that, taking the country as a whole, the number of fowls shown would be increased by at least fifty per cent were such smaller occupations included. The increase in ducks would be very small, and of geese and turkeys practically nil.

The averages given in Table II will show the distribution of the various classes of poultry. So far as fowls are concerned more chickens than adult stock were recorded in 1908 in the North Eastern and South Eastern divisions. In all the others, as in Wales and Scotland, the adults exceeded the young birds, showing that there egg production is the main object. So far as ducks are concerned, young ducks were double the number of old birds, geese about 180 goslings to 100 adults, and turkeys 250 young birds to 100 adults. Of the last named the highest percentages were in the Eastern, North Eastern and South Eastern divisions of England, where the proportion was 300 to 100.

The tendency for specialisation is more noticeable in the production of high class poultry than where eggs form the chief object. That is true in Britain as throughout Europe. We have the great chicken rearing and fattening industry of south-eastern England, comprising the counties of Sussex, Surrey and Kent; duck breeding as found in Buckinghamshire and parts of the adjacent counties; and turkey breeding carried to its highest point in East Anglia, that is, Norfolk, Suffolk and Cambridgeshire. Formerly in sections of the country, such as Cumberland and Lincolnshire, geese were largely bred. The decline, however, in demand for these birds has been considerable.

These specialised industries are by no means modern, but have increased considerably within recent years, and the tendency is to extend over wider areas. The south-eastern counties have been famous for high class chickens for considerably more than a hundred years, and these still hold the premier position for quality of flesh produced. The great feature of this industry is the benefit derived by farmers and cottagers living in the district over a wide area, as they hatch and rear the chickens, selling them at about three months old to the fatteners, who complete the process by feeding off, then kill, pluck and dispatch to market. Very few farmers attempt to fatten, and fatteners seldom hatch and rear chickens. This division of labour has many advantages, and the prices obtained by rearers are, as a rule, highly profitable to them. During some periods of the year as much as 3*s.* to 3*s.* 6*d.* is obtained for lean, twelve-weeks-old chickens, for which the demand is much greater than the supply.

In the duck districts there is also a dual system, though a different one. There the rearers are mainly small occupiers, some with not more than an acre of land, on which they will raise from 1 200 to 2 000 ducklings in one season. These men do not, however, as a rule keep the breeding stock, but purchase eggs for hatching from farmers in the county. When the ducklings make their appearance these are forced rapidly forward, and can be grown to a weight of from 4 to 5½ lbs. in less than nine weeks. For good birds placed on the market in March, April, May and June, 9*s.* to 15*s.* per couple can be obtained. There are, also, a few large duck plants, one of which has been conducted for several years, and sends out about 40 000 birds per annum. Simplicity is the great feature in duck rearing.

Turkey farming in East Anglia is mainly on large farms, where these birds form only a part, though an important one, of the general operations.

In many sections wide spread attention has been paid during recent years to egg production, of which the Island of Orkney is an example. As a rule, however, the increase has been chiefly due to the large number of fowls kept by farmers, and the greater attention given to breeding and management. What are called poultry farms, that is, large plants on intensive lines, whilst tried in several cases, as in America, have not been very successful, and are comparatively unimportant factors in the total of native supplies. The policy adopted has kept in view as its first object the development of poultry-keeping as an integral branch of general agriculture. At the same time, however, more intensive methods, more especially on smaller occupations and in suburban and manufacturing areas, are receiving a considerable amount of attention.

In this connection it is realised that increased numbers of poultry kept, whether upon general farms or special plants, involve greater risks of disease and consequent loss to the owners, and also that, with a view to reduction of cost of production, either by improvement of stock or by lessened expenditure for food, or enhancement of returns, there is a great and growing demand for research with respect to the first named, and for experimental work, suitable for application by farmers and others, in so far as the latter are concerned. It is in these directions that Great Britain has been behind some other countries. A few experiments have been carried out, some of considerable value, and a limited amount of research, more especially in connection with breeding, has been conducted. That the field is as yet scarcely touched is generally recognised. The number of problems presenting themselves for investigation is very great, and these will assuredly rapidly increase with growth of the industry. Various proposals are under consideration at the present time, one of which includes the establishment of a National Poultry Institute, which would be a centre for conducting higher experimental work on practical lines, as well as for the treatment of diseasse. It is also anticipated that poultry will, at an early date, receive their full share of attention at the scientific laboratories of the Board of Agriculture and Fisheries. Hitherto it has been almost entirely a question of money. Thanks, however, to the sums available by means of the Development Fund, the Department of Agriculture will be able to undertake investigations and research, and to make grants to public bodies and institutions capable of undertaking this important and necessary work. Recently such grants have been made to the Agricultural Department of Cambridge University for research in breeding on Mendelian lines, one object of which is an endeavour to produce a race of fowls which shall be non-sitters and yet produce coloured shelled eggs, and to the Cheshire County Council for experiments in respect to table poultry. Further, the Utility Poultry Club has been given a grant in aid of a Twelve Months' Laying Competition on larger lines than attempted before in this country. That, however, is demonstration rather than investigation.

Turning to local Rural Instruction, hitherto, so far as poultry are concerned, the teaching has been mainly by lectures and addresses, supplemented by short classes and demonstrations, and perhaps visits on the part of the lecturer. The tendency now is more to the employment of practical instructors, who will go to the farms and there demonstrate better methods, showing as opportunity offers how to perform various operations, and give guidance as to the adoption of improved systems. Besides this some County Councils have made grants to rural schoolmasters, who are sufficiently interested, for the establishment of small poultry plants for use in the schools.

In connection with the higher Agricultural Colleges, whilst in a few instances a limited amount of attention has been given to Poultry in the shape of theoretical lectures, up to the present time that is very inadequate. To some extent this may be explained by the fact that larger farmers have not included poultry to any extent among their live stock, save on a non-economic basis, mainly for supply of their own household requirements or to provide «pin-money» for the wives and daughters. A further fact is that as yet there remains a considerable amount of prejudice among farmers with regard to College teaching, and that many of the students are townsmen desirous of entering upon country life either at home or in the colonies. Also, several agricultural teaching centres are associated with universities or university colleges in the great cities, where the conditions are not favourable to the smaller branches of farming. Those institutions which are doing most for poultry have farms for teaching and demonstration, of which the following are leading examples:

Sussex Agricultural College, Uckfield.
Midland Dairy Institute, Kingston.
Lancashire County Council School, Hutton.
West of Scotland Agricultural College, Kilmarnock.

Developments are, however, taking place at other institutions, notably Aberdeen, Bangor, Cirencester, Harper Adams (Newport), and Leeds University, which it is hoped may in due course extend operations in the direction indicated. What is now advocated is that at every Agricultural College systematic instruction in poultry-keeping should enter into the curriculum, and that connected therewith should be a well equipped poultry station for teaching, practice, demonstration and experiment.

One of the special features which characterises the Poultry Industry in Great Britain is the diversity of breeds found throughout the country. These are due, first to the natural variations of climate and soil met with even within a limited area; second, to the great number of smaller breeders, who give play to their own predilections, and have made selection on independent lines; and, third, to the influence of poultry exhibitions referred to below. Even in the fattening districts there is not that uniformity of race which is found in many other lands. Generally, however, during recent years the tendency has been to greater popularity of a few breeds or crosses from these. Among farmers those races which are finding the greater amount of favour may be mentiond: the Italian (Leghorn) fowl, more especially the white variety; the Wyandotte; and the Orpington. The two former of these are kept specially for egg production, and the latter largely for its table qualities. In ducks the Aylesbury stands easily at the head, as its rapid growth is greatly appreciated, fitting in with our special trade. Of geese the Embden and the Toulouse are about equal in favour, and in turkeys the Bronze American is most widely distributed.

It is unquestionable that exhibitions have exerted a very great influence in awakening interest in the Poultry Industry, more especially in respect to the improvement of breeds. Of these a very great number are held annually, between two and three thousand. Within recent years a great cleavage has arisen between what is known as "fancy" breeders, that is, exhibitors, and such as are concernend mainly with the utility side, by which is meant the meeting of market demands for food supplies. At one time farmers and others looked to the exhibitors to provide them with stock birds. That is no longer the case. Breeding for exhibition has become largely professional. The extremes to which abnormal and non-economic points have been carried, have ruined several breeds in so far as their profitable qualities are concerned. Even our agricultural shows have contributed to the same result. There has, consequently, arisen a large class of specialist breeders who do not exhibit, and who regard the egg or flesh qualities as the main object. The sale of breeding fowls, eggs for hatching, and day-old chicks has grown enormously of late years.

With regard to handling and sale of produce, the conditions in Great Britain differ materially from those met with in some other countries wherein production is much greater than consumption. In Britain the reverse is the case. Our exports of poultry and eggs are nominal, except for breeding stock, whilst our imports (inclusive of Irish supplies) are in value nearly £13 000 000 per annum.

Co-operation in respect to the marketing of eggs and poultry has not advanced so rapidly in England and Wales as in Ireland and Denmark, or more recently in some parts of Scotland. Nearly fifty local societies are engaged in this business, so that the country is as yet very incompletely organised on co-operative lines. Such societies have difficulties to meet with not found elsewhere to the same extent, mainly owing to the fact already mentioned that over large areas of England and Wales the consuming population exceeds greatly the number of possible producers. I know of no county in either country which is able to meet its own requirements in these directions all the year round, as a consequence of which immediate demand is often very great. Outlets are at hand, and prices obtainable from householders or retail traders are high, so that the need for co-operative marketing is not felt, nor is the margin good enough to make such combination profitable. The effect, however, of the work done by the National Poultry Organisation Society during the last fourteen years has been remarkable, equally in the direction of increased production, of improved standardsof quality, and better methods of marketing. Traders have been compelled to adapt their systems to modern conditions, and to pay higher prices to producers, otherwise by co-operative effort they would lose their business. In this way has been secured a great and lasting advance in quality of home produce, more especially in respect to eggs, which at one time, as is still the case in many districts, occupied much too long a time in reaching the consumer, with a consequent heavy loss in value. The society in question has issued a large number of leaflets, and has also published reports on the Poultry Industry in America, Denmark and Sweden, Belgium, and Germany, which have had a wide circulation. In this manner knowledge of what is being done and the methods adopted elsewhere has been disseminated. An estimate has been made that the annual value of the eggs and poultry now produced in the United Kingdom is about £9 000 000 and greater by £6 000 000 sterling than was the case 20 years ago.

Sheep Breeding in Hungary

by

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Until quite recently, the next most important branch of agriculture in Hungary to cereal growing was sheep breeding. Already in the twelfth century, there were in Upper Hungary flourishing dairy sheep-farms and the mountaineers had also turned their attention to improving the wool of their flocks, even before the Merino breed had spread throughout Europe. The sheep-breeding industry continued to increase, and in the seventeenth century George Szelepcsényi, Cardinal of Esztergom, and the Archduke Eugène interested themselves in the improvement of wool, although, until the eighteenth century, only one indigenous breed was known in Hungary, the Racka breed (***Ovis strepsicerus***) and one hardy breed (***Ovis aries***).

From 1773, when the Spanish Merinos were introduced into Hungary, only small farmers continued breeding Racka sheep, average and large farmers taking to Merinos exclusively. From this time, the Merino spread rapidly, and so great an impetus was given to sheep breeding that even the Hungarian magnates turned their attention to this industry. It was only later, on the abolition of statute labour, when the domains began to turn their pastures into arable land, that the number of sheep decreased. The pastures decreased from 18 487 500 acres in 1869 to 16 354 500 in 1885 and 16 070 000 in 1895. Further, the importation of overseas wool, especially of the Australian product (which was imported into Germany for the first time in 1850 by English merchants, the amount imported into Europe in 1869 being 1 500 tons) caused a great change in our sheep farms.

In the last quarter of the past century, owing to the low price of wool, breeding sheep for mutton became more general, and large importations of mutton-producing breeds from England were made. These animals were seldom used to produce pure-bred offspring,but were crossed, the crosses often making flocks of excellent quality.

In the interests of the dairy sheep farms, and especially with a view to the improvement of the Hungarian Racka breed, Friesian sheep were imported in 1884; these animals stand the climate of Hungary well and trasmit their weight and milking qualities to the cross-breds.

Finally, from 1890 on, the first Rambouillet sheep were introduced in order to still further increase the weight and improve the wool of the native breed. The Rambouillet sheep were increasingly bred; while later, the early maturing Soissonnais and Chatillonais Merinos were acclimatized for the same purpose.

The most characteristic representative of the Hungarian breeds is the Racka from the Great Plain (Alföld); this animal still exists in its primitive state on the «Puszta» of Hortobágy, and is also found in the counties of Arad, Békés and Csongrád. The Racka of the plains is a large animal; height at withers 32 to 34 inches in males, 28 to 30 inches in ewes; length of body 34 to 36 inches in males, 32 to 34 inches in ewes. The height at the withers is thus remarkbly large in comparison with the body-length. The live-weight of rams is 130 to 135 lbs., of ewes 100 to 110 lbs. The horns of both rams and ewes are long; they bend somewhat forwards and are twisted. At the conjunction of the face and skull, between the frontal bone and the nose, occurs a characteristic depression. The woolly tail reaches the hocks.

The wool, which is 8 to 12 inches long, is composed of thick staple and down; it is used in the manufacture of thick cloths and blankets; in making felt it is necessary to mix it with finer wools. This breed has to a large extent been superseded on the great Alföld by Merinos; but where the liver-fluke decimates Merino flocks, the Racka sheep flourish, as they are not so susceptible to the attacks of this parasite, and avoid damp places. Besides the Racka of the plains, there is also the mountain race; this is commonest in Transylvania and Upper Hungary; its characteristics have, however, been modified by numerous crosses. It is a weakly, small animal, except in the mountain districts of the counties of Krasso-Szörény and Torontál. In Transylvania also, in certain districts where it bears traces of crossing with Lincolns, this sheep attains a larger size.

The sheep are put to the tup at a year and a half. Lambing takes place usually in February, and the lambs are either sold soon, or else kept till the middle of May, when the sheep are first milked; milking generally continues till the end of September. The variations in the number of sheep in Hungary have been as follows.

1851	10 600 000
1869	15 000 000
1895	7 500 000
1905	6 700 000
1911	7 700 000

As is seen, the number was least in 1905, after which it once more increased. The number of sheep per 1 000 inhabitants was 1051 in 1870 726 in 1880, and 418 in 1911.

The decrease in sheep is recorded especially in the districts where Merinos were preponderant, *i.e.* in the Great Plain (Alföld), and on the right bank of the Danube.

In 1880 the total still included 67 per cent. of Merinos; in 1911 this percentage sank to 29, and while the Merinos decreased by 38 per cent., the number of sheep kept for milk and mutton rose from 3.2 to 4 millions; this shows that breeders consider milking ewes, and secondarily mutton sheep, as more paying than Merinos, whose chief value lies in their wool.

These figures are further explained by the fact that the breeding of milch sheep is chiefly in the hands of small owners in mountain districts, where even now, sheep find abundant pasturage, while Merino breeding was continued on the large estates in the plain (Alföld) and in the districts on the right bank of the Danube, where owing to the rapid increase of intensive cultivation, the animals were gradually deprived of their pastures.

In Hungary, Racka or Merino flocks graze in the open almost throughout the year, except during the coldest winter months; and even then, if there is not much snow, they pass several hours daily at grass. Sheep breeding is thus based in the first instance on pasturage, partly on pastures unsuitable for other animals, and partly on the temporary pastures of farms where intensive cultivation is practised.

Wool and lambs are the chief sources of revenue of the Merino sheep farms. Shearing is done once a year, in June, the sheep being sometimes washed previously. On farms which devote their attention to lambs, lambing is very early, in December or January, so as to profit by the very high prices made by early lambs. The practice is, however, costly because better feeding is necessary. Sheep farms which depend on the sale of breeding animals, or the fattening of wethers, fix the lambing time for the end of February or beginning of March. The large sheep farms are occupied also with the sale of breeding animals, either by notice of sale, or at auctions, but especially at a Show organized every spring at Budapest by the National Hungarian Farmers' Association. From 1000 to 1500 breeding sheep are sold, of which the price varies as follows:

	£	s	d		£	s	d
Negrette-Electoral: ram	5	0	0	to	20	16	8
» » ewe	2	10	0	»	4	3	4
Combed Hungarian: ram	4	3	4	»	8	6	8
» » ewe	1	13	4	»	4	3	4
Rambouillet: ram	4	3	4	»	16	13	4
» ewe	4	3	4	»	8	6	8
Early Merino: ram	4	3	4	»	33	6	8
» » ewe	3	6	8	»	4	3	4
English mutton breeds: ram	7	10	0	»	8	6	8
Racka: ram	1	15	4	»	4	3	4
Friesian: ram	4	3	4	»	8	6	8

As a rule the only food given in winter is straw with a little hay; only on first class farms a little grain is given. The wethers are generally put up to fatten at 18 months; besides straw, hay and beet pulp, they get 1 3/4 to 2 1/4 lbs. of maize meal per head.

According to the census taken on February 28, 1911, the total number of sheep in Hungary, without lambs, amounted to 6 677 680 head. Fixing the net return at 2*s* 1*d* per head, the total returns from sheep come to about £700 000. The net return, of the Merinos especially, could not be put higher than 2*s* 1*d* per head, and is in fact often less. The following figures give the receipts and expenses of a flock of 4200 fine-woolled sheep in 1910:

Receipts.

	£	*s*	*d*
1) Sale of 34 270 lbs. of wool at about 8*d* per lb. . .	1153	5	10
2) Sale of sheep:			
30 culled rams at 26*s* 8*d* = £ 40	587	10	0
240 culled ewes at 13*s* 4*d* = » 160			
310 fat wethers at 25*s* = » 387 10*s*			
3) Mutton sold to servants and labourers.	60	8	4
4) Sale of skins	48	15	0
5) 3000 tons of dung at about 4*s* 2*d* per ton.	625	0	0
Total . . . . £.	2474	19	2

Expenses.

	£	*s*	*d*
1) 5% interest on capital expended on 4200 animals calculated at 12*s* 6*d* per head: £2625	131	5	0
2) Rent of stable calculated at 5% of a building worth £1875	93	15	0
3) Salaries of persons employed	187	10	0
4) Salt and other expenses.	48	15	0
5) Shearing.	37	10	0
6) Rent of 725 acres of pasture at about 5*s* 10*d*	212	15	0
7) 512 cwt. of maize at 4*s* 9*d*	121	6	8
8) 276 cwt. of oats at 6*s* 10*d*	93	6	8
9) 433 cwt. of tail wheat at 2*s* 1*d*.	45	16	8
10) 74 tons of mangolds at 8*s* 6*d*	31	5	0
11) 245 tons of hay at 42*s* 4*d*	520	16	8
12) 25 tons of lucerne at 50*s*.	62	10	0
13) 314 tons of spring-grain straw at 17*s*	291	13	4
14) 303 tons of winter-grain straw at 10*s* 2*d*	200	0	0
Total . . . £	2078	5	0

The net return is thus £396 14*s* 2*d*, or 1*s* 10 3/4*d* per head. But taking into consideration that the cost of upkeep of dairy-sheep farms has decreased of late years, while the price of cheese has risen considerably, the return of these sheep-farms can be put at a slightly higher figure: 2*s* 11*d* per head.

The following is a description of the internal administration of some large sheep-farms.

1. *Rambouillet Flock of the Estate (in trust) belonging to Marquis Alex. Pallavicini at Mindszentalgyő.* — The sheep lamb in January, 90 per cent. being fertile; the percentage of twins is from 8 to 10, so that the increase is nearly 100 per cent. The lambs are weaned at four months and until this time they are given about 10½ oz. of oats, and lucerne hay *ad lib*. From the beginning of May to November, the whole flock is on pasture. During winter, the lambs get 1½ lb. and the ewes 2¼ lb. of hay, and they are allowed as much straw (from spring and winter grain) as they will eat. The ram runs with the ewes in August, when the latter are 20 months old. The live-weight of the old rams is 176 to 255 lbs., that of wethers 132 to 154 lbs., and that of ewes 110 to 143 lbs. The wool is shorn unwashed; the average fleece of old rams is 16 lbs., while wethers give 11 lbs. and ewes 9 to 11 lbs. The general average is 9 to 13 lbs., yielding 35 per cent. wool. The value of the wool is about 8¼*d* per lb. The surplus stock is partly sold for breeding purposes and partly as culls; 50 or 60 stud rams are sold annually at 6 to 13 guineas. The culls are sold at the current price immediatly after shearing, when they have grazed for six weeks.

2. *Emilie Skublics' Rambouillet Sheep-farm at Zalaszentmihály.* — Lambing: 80 per cent. of the ewes lamb (twins 7 per cent.): takes place in January. The lambs are weaned at three months. Whilst being suckled, the lambs eat first quality hay *ad lib.*, as well as a mash of oats and maize. The flock grazes during summer; in winter they get clover and "three months' hay" (1) as well as straw. Live weight: ram 224 lbs., wether 128 lbs., ewe 117 lbs. The ewes are served in August, when towards two years old. The wool is shorn unwashed, the ram's fleece runs to 22½ lbs., the ewe's 13 ¾ lbs. The wool is sold in Budapest at 6 ¾ *d* to 7¼*d* per lb. Every year 50 or 60 yearling rams are sold at the average price of 6 guineas, and culls fetch 16*s* 8*d*.

3. *Negrette Electoral Sheep-farm of Count Louis Károlyi at Totmegyer.* — In the pedigree flock, the ewes lamb twice a year, in January and in July; in the other flocks only once, in January. The percentage of ewes lambing is 70 to 85; twins 2 to 4 per cent. The lambs are weaned at 20 to 24 weeks; up to weaning the pedigree lambs get abundance of oats and lucerne hay. The daily ration of the other lambs is 8 to 10 oz. of oats and 1 lb. of lucerne hay. The young ewes are put to the tup in the middle of July when 2½ years old. In summer they run on grass; the winter ration consists of 1 to 1 ¾ lbs. of hay, ¾ to 1 lb. of spring-grain straw, 1 to 4½ lbs. of beet tops and leaves, and 2¼ lbs. of beet pulp. The fleece of the rams, shorn unwashed, averages 17½ lbs.; the other sheep are washed and the fleece weighs on an average 2½ lbs. The first is sold at 7½*d* to 9*d* per lb., the second at 2*s* 8*d*

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(1) A mixture of vetches and wheat, oats, etc. (*Ed.*).

to 3*s*. The live-weight of the rams is 145 lbs., that of the ewes 88 lbs., and that of the wethers 110 lbs. Store wethers fetched 29*s* the pair in 1908. The wethers are sometimes fattened, when they are given daily 10 oz. of crushed maize, 10 oz. of beans, 2¼ lbs. of hay, 3¼ lbs. of beet pulp and a little spring-grain straw. Sometimes they get 1 ¾ to 2½ lbs. of whole maize, 2¼ lbs. of hay, and 3½ lbs. of beet pulp. Every year 30 to 40 rams are sold at prices ranging from £ 5 to £ 25.

4. *Negrette Electoral Sheep-farm of Count Ladislaus Károlyi at Derekegyház.* — The ewes lamb once a year, in January. The average of ewes lambing is 85 per cent., twins 4 per cent. The lambs are weaned at 10 months, and while being suckled, are given oats and ground maize *ad lib.* After weaning, this food is given to the lambs until they are a year old. The same food is given to the rams during the tupping season and to the ewes while suckling their lambs. The ewes are put to the ram in August, when 2½ years old. The unwashed wool fetches 9*d* to 9½*d* per lb. in Budapest. The average fleece weight is 8 ¾ lbs. Culled ewes are sold at 15*s* to 16*s* 8*d*, old rams at 25*s* to 27*s* 6*d*, and wethers at 20*s* to 25*s* the pair. The average live weight of full-grown sheep is 70 lbs. Wethers to be fattened are put onto good alkaline pasture and get ½ to ¾ lb. of concentrated food. Rams are sold at prices ranging from £ 6 5*s* to £ 12 10*s*, ewes at £ 2 1*s* 8*d* to £ 4 3*s* 4*d*.

We will now give some details as to the production of wool and the wool-trade in Hungary.

The conditions already mentioned led especially to a perceptible decrease in the production of fine wool for cloth manufacture; this type is produced less and less in Europe, and, as it is also necessary for making felts, the demand for the Hungarian produce is steadily increasing, and foreign manufacturers give very high prices for it. The combed Hungarian wools are also in great demand, as their quality is considerably superior to that of average overseas wools, for it is stronger and free from thistles, and therefore much sought after for making very strong yarn.

The following are some details on the chief qualities of Hungarian wool. The average yield, calculated at 10 per cent. of moisture, is shown by the following figures, which are based on the examination of numerous samples over twelve years:

Quality	Yield per cent.
Unwashed wool:	
Merino, for cloth	22.4
Merino, for textile fabrics	28.4
combed Merino, for cloths	31.9
Cigája and Racka	51.8
lambs'	31.7
Wool from washed sheep:	
Merino, for cloth	71.8
Merino, for textile fabrics	64.6
combed Merino	62.6
Cigája and Racka	76.6
lambs'	67.7

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lambs'	67.7

	Lowest and highest price per pound																			
	1908				1909				1910				1911				1912			
	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d
From washed sheep:																				
Merino, for cloth, superfine .	2	1¼	2	3¾		—	2	4¾	2	2¼	2	5	2	1	2	3½	2	1	2	5½
» » » fine . . .	1	10¼	1	11¼	1	10¾	2	2¾	1	11¼	2	1	1	8½	2	2	1	8½	1	10¾
For weaving, fine.	1	6¾	1	10¼	1	4¾	1	8		4½	1	7½	1	6¼	1	8½	1	4	1	7½
» » demi-fine . . .	1	3	1	5½	1	4	1	6¼	1	3½	1	7	1	4	1	6¼	1	3½	1	5
» » coarse.	1	0½	1	3	1	2½	1	4	1	1¾	1	3½	1	1½	1	4	1	1	1	3½
Combed, washed	1	0¾	1	3¾	1	3¾	1	5¾	1	4	1	5	1	3½	1	5	1	3½	1	4½
» demi-fine, A-B . . .		11	1	2	1	1¾	1	4	1	1	1	4	1	1½	1	3½	1	1½	1	3½
» cross-bred, B-C, containing sand and burs . .		8¼		10½		9	1	1½	1	0¼	1	2½		11½	1	1½		10½	1	1½
Cigája, C-D		6¾		8		9		10½		9½		11		8¼		10¼		8¼		10
Racka, E-EE		6½		7¼		8¼		10½		7¾		10		7¾		9½		8¼		10
Lambs', superfine.	2	2	2	9½	2	3¾	2	10	2	5	3	0	2	6	3	0	2	8	3	0
» demi-fine	1	1½	1	8½	1	3	1	10¾		10½	1	5¼	1	3½	1	4½	1	3½	1	5¼
» middling and coarse		9		10½		9	1	0¾		10½	1	1½		9½	1	1½		9	1	0¾
Shorn twice, from mountains, white and demi-fine, A-B .		11¾	1	0¾	1	0¾	1	2	1	2	1	2½	1	2	1	2½	1	1¼	1	1½
Shorn twice, from mountains, middling and coarse, B-C .		11		11¾		10½		11¾		9½		10½		9		10¼		8½		9½
Unwashed:																				
Merino, for cloth, superfine .		6		7¾		7¼		8¼		6¾		8½		7¾		9¼		7¾		9½
» » » fine. . . .		5½		6½		5¾		7¼		6		6¾		6½		7¾		6		7
For weaving, fine.		5½		6		6¾		7½		6¾		7¾		6¾		7½		6¾		7¼
» » demi-fine . . .		5		6		6½		6¾		6½		6¾		6½		6¾		6½		6¾
» » coarse, B-C . .		4½		5½		6		6½		6		6½		6		6½		5½		6½
Combed, fine, AA-A		6½		7¼		6½		7½		7¾		8½		7¼		8		6½		7¾
» demi-fine, A-B. . .		5½		6½		6		6½		6¾		7¼		6		7		5½		6½
» cross-bred, B-C, containing sand and burs. . .		4		5½		5¼		6½		5		6¾		5½		6		4¾		5½
Cigája, C-D		4½		6½		5		6¼		5½		6½		6		7½		5¾		8¼
Racka, E-EE		4		5		4		6		5		5½		4		5½		3½		4½
Lambs', superfine.		6¾		9		7¼		9¼		6¾		9		6½		9½		7¾		9½
» demi-fine.		5½		7½		5¾		7½		5½		7½		5½		7¼		6		7
» middling and coarse		4½		5½		4½		5½		4½		6		4		5½		4		5

That these data may be properly understood, it should be remarked that they include figures from both small and large farms, while those from large estates usually far exceed the figures given. Taking this into consideration, it may be shown that, not only is the yield of Hungarian wool large, but that the product possesses extraordinary strength, and therefore, as just said, is much prized and fetches a high price.

In Hungary, since 1894 (Budapest) wool has been sold by public auction twice a year, in July and October. The amount of wool sold last year at the July auction was 11 669 bales, while at the autumn auction 11 011 bales were sold. Besides the Budapest public auctions, there are public wool fairs held at Losonez and Miskolez. At the auctions superfine wools for cloths are the most sought after, and are considered more and more as being a Hungarian speciality.

The accompanying table gives the fluctuations in the Hungarian wool market during the last five years.

As for the wool trade, the importations tend to increase and the exportations to decrease, as is shown by the following tables :

Imports.

1906	6 361 650	lbs.	worth	£290 728	10s	0*d*
1909	7 960 900	"	"	£425 151	16s	10*d*
1910	8 844 900	"	"	£445 581	9s	2*d*

The largest amount of imported wool comes from Rumania, which country in 1911 furnished 2 618 000 lbs. Almost the same quantity came from Austria and Germany together, while the total import from Belgium, France, England and Russia amounted to 2 million pounds.

Exports.

1906	20 664 800	lbs.	worth	£1 049 647	0s	0*d*
1909	16 907 700	"	"	£ 806 713	4s	2*d*
1910	16 660 000	"	"	£ 818 315	0s	10*d*

The largest exportation is to Austria : 11 286 300 lbs. ; next comes Germany with 3 119 300 lbs., while still less is sent to Servia and Russia

Hungary has also a considerable import trade in woollen stuffs. In 1910, 33 142 750 lbs., worth £6 097 008 were imported ; of this amount about 11 million pounds came from England and Germany, and the remainder from Austria. On the other hand, in 1910 Hungary exported 4 782 000 lbs. of woollen stuffs, worth £621 154, of which only 233 250 lbs. were sent to Bosnia and Herzegovina, the rest going to Austria. In comparing the trade statistics of 1905 with those of 1910, it can be stated that in Hungary, the woollen stuffs trade is on the increase. But, while our exports had scarcely doubled during this period, the imports, which in 1905 were not over 14 032 600 lbs., worth £3 106 853, had already more than doubled in 1910.

Cheese from ewes' milk is a considerable item in the trade of Hungary. The following figures give the exports and imports for 1910:

Imports	3 882 900	lbs.,	worth	£101 338 14s 4d
Exports	8 363 700	»	»	£112 520 15s 0d

While the imports have rarely exceeded the above sum, the exports show a slight, but continuous, increase. The chief export was cheese made from the milk of "Liptó" sheep, which is a cross between the Racka breed of Upper Hungary and that of the mountainous districts of Transylvania. This cheese is soft and has a pleasant flavour; large quantities are exported, even to England. The perceptible increase in Liptó sheep cheese is shown by the following figures, which refer to three years:

1901	3 491 000	lbs.,	worth	£ 60 700 16s 8d
1905	4 577 000	»	»	£ 82 178 19s 2d
1910	5 047 800	»	»	£108 876 10s 0d

Hungary's foreign sheep and mutton trade is considerable. In 1910 she exported 135 725 head, worth £162 223, chiefly to Austria, but also to Germany and Switzerland, while the imports were only 173 live sheep worth £125 12s 6*d*.

In 1910, 2 357 400 lbs. of mutton, worth £53 465, were exported to Austria. This does not include lambs of live weight below 31 lbs.; in 1910 12 832 of these, worth £5 598 10s, were exported, and 2 135, worth £923 10s, were imported. While the export of mutton hardly varies, there is a perceptible decrease in the number of live sheep exported. Thus, in 1901 the number of the latter was 205 340 head, worth £136 270, while in 1905 it had fallen again to 150 463, worth £133 793.

The trade in skins of sheep and lambs in Hungary is also considerable. In 1910, 2 421 500 lbs. of sheepskins, worth £45 767, were exported, while 1 715 600 lbs., worth £42 805, were imported. In the same year 1 710 000 lbs. of lambskins, worth £72 722, were exported, and 712 750 lbs., worth £36 670, imported.

These data serve to show that, while the stock of sheep tends to decrease in Hungary, as indeed is the case in the other countries of Europe, it is at the present time very considerable and is the source of a large revenue. On the other hand, given that: 1) the agricultural development of the mountainous districts cannot keep pace with that of the great plains; 2) the fields of these districts, which are difficult to cultivate, form abundant pastures; 3) dairy-sheep farming is lucrative, it may be supposed that the decrease in the number of sheep in Hungary will not continue, and that even a fresh impetus in favour of sheep breeding is not impossible.

The Use of Agricultural Implements in Japan

by

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The traveller in the country districts of Japan is struck with the smallness of the fields, the steepness of the terraced hills and the absence of pastures as well as of animals working on the farms. Closer investigation will show that rice being the most profitable crop, wherever it is possible to do so the fields are so laid out that they can be flooded with water. Inquiry as to the size of the holdings will show that they are small and that they are in a large proportion cultivated by tenant farmers.

These conditions indicate that agricultural implements, such as those used in Europe and America, are rarely met with. The system of culture is intensive and good crops are obtained, so, as one would expect, the implements in use are well adapted to local conditions.

Of these tools the hoe, or *kuwa* rather, is by far the most important. It is used in a variety of ways, and with a skill surprising to one accustomed only to the simple uses of the hoe in occidental hands. It is used for digging up the soil, thus taking the place of the spade, which is little used. With the *kuwa* also the soil is pulverized and levelled, the tool thus accomplishing on a small scale the work of the plough, the harrow and the roller.

As to the construction of this most useful tool, it resembles the German "Handhack", but differs from this in the smaller angle that the blade makes with the handle, and the greater length of the blade. The angle is often as small as 30 degrees, and occasionally as great as 85 degrees. The blade is from 4 to 8 inches broad and 10 to 20 inches long; while the handle varies in length from 2 to 6 feet. Where the blade is of the greater lengths, it is made of wood with an iron cutting edge and thus both the weight and the cost are reduced. It is said that there are as many as a thousand different kinds which have been worked out to meet the demands of the various conditions of the soil and the different purposes of use. When wet or heavy soil is to be worked, the blade of the *kuwa* is divided into two, three or four prongs, as the European spade changes to a forked spade.

Next in importance to the hoe, as an agricultural implement, comes the plough or *suki*. There are two types of the plough: one resembles the single shovel plough of America, and the other the Meklenburger Haken. The share and mouldboard are made of cast iron and the other parts always of wood. The mouldboard, being plane or slightly curved, acts principally to pulverise and mix the soil. The turning action is not as great as in the plough of European type.

The striking feature is that one never sees a pair of horses or a yoke of oxen attached to a plough, the animal used being always alone.

This kind of plough is specially adapted for the cultivation of the more or less wet soil of the rice fields, in which ploughs of occidental type would be of no avail. This primitive form of plough is also well adapted for throwing the soil into ridges after the rice crop has been harvested, so that the earth may dry sufficiently for the growth of the secondary crop which is obtained from the land before the time for transplanting the rice.

After the rice field has been ploughed, it is flooded and the soil is thus easily mixed and broken up with the aid of the so-called "horse-hoe" or *ma-kuwa*, which is, in fact, a kind of one-rowed harrow.

In doing this work by hand, a kind of rake is used for the purpose of mixing; while the forked hoe may take the place of the plough in breaking up the field.

In cultivating the crops, such implements as the horse hoe and the "Hackpflüge" of Germany are not used, being replaced by a light form of the ubiquitous *kuwa*. A tool like the weeding hoe of the Occident is also in use.

In weeding rice fields, an implement somewhat like the Norwegian harrow is used. Teeth are set either in straight or curved lines in a wooden revolving cylinder and the implement is drawn by hand. In addition to the above-mentioned implement, there are various other tools used in weeding.

In seeding, the work was done by hand only, until recent years, and great skill was attained. Nowadays simple drills and seed droppers, invented in the country, are sometimes used. They are small implements and are worked by hand. Wheat and barley are sown in drills, but rice is thickly sown in small seed-beds from which the young plants are transplanted.

For harvesting grain, the sickle, or *kama*, is used altogether. This instrument is, in effect a diminutive scythe with a straight or slightly curved blade and a straight handle set at a right angle or an obtuse angle to the blade. The handle is from 8 to 16 inches in length; but for cutting tall grass, a sickle with a longer handle is sometimes used.

Scythes are coming into use in some parts of the country; but mowers and reapers are seen only on a few large farms devoted to raising of cattle, and they are mostly of American make.

For harvesting roots, the *kuwa* again is used, no such implements as the potato digger and "Rübenheber" being met with.

When the sheaves of grain are ready for threshing, various simple devices are used. Ordinarily, the heads of grain are pulled from a double handful of stalks by whipping these into a kind of comb and pulling the heads off between the teeth. The comb is fixed to an immovable bench, which is about half the height of a man, and is set at such an angle as to meet the descending stalks at about a right angle. The teeth are about twenty in number and are of sizes suited to the grain to be threshed.

The hulls are next removed by grinding the grain between two light cylinders arranged like the upper and the nether mill-stone.

The grain is separated by a kind of winnowing machine, called *tomi*, which differs but little from the "Getreide centrifuge" with its arrangement of sloping vibrating sieves. For small quantities of grain, the separation is effected in the primitive way by taking advantage of a suitable wind.

Considering the condition of the agricultural industry we are led to make the following suggestions:

1. For cultivation, the use of farm animals should be increased.
2. The advance in the co-operative system for threshing should make it possible to use animals and mechanical powers in this work.
3. The use of ploughs and harrows constructed to suit the needs should be encouraged. The "Hackpflüge" or vineyard plough would seem to be nearly adapted to the needs in dry fields.
4. In the case of wet fields, special implements must be invented, since necessity has not called for the invention of such devices in other lands.
5. The drills and dropping machines now in use should be improved.
6. For harvesting there seems to be no possibility of using Western machinery, and the sickle should be so modified as to be made more effective.
7. In the preparation of grain, however, it is most desirable that Western threshing machines should be brought into use.
8. There is no special demand for agricultural implements used in connection with cattle raising.

Such, in brief, is the present condition of the agricultural part of the country with regard to the use of implements. But some change will be necessary owing to the concentration of labour in the rising industrial centres and the increased demand for agricultural products together with the decreased supply of hands. This new condition seems to demand an increased use of machinery together with an increase in the use of farm animals or some mechanical motive power.

The straightening out of the old irregular boundaries between the fields and the re-allotment of the land which is now in progress throughout the country will pave the way for the use of machinery drawn by animals or other motive power.

The kind of implements to be used must be determined by careful study of local conditions, and the Government has already instituted a special section in the State Experimental Station for the investigation of this matter.

Many of the implements of the Occident are adapted for use on large farms only, and none have yet been invented suited for use in the wet ground of the rice fields. We must look for adaptation of imported implements, and improvement of existing domestic types, to bring into being the devices called for by the new conditions in New Japan.

Some thirty five years ago, the Government established a farm implement factory, but at that time the need of new implements was not felt and the enterprise, which was in advance of the times, ended in failure. Nowadays private enterprise is, on the one hand, bringing in imported implements such as experience shows to be in demand; and, on the other hand, is manufacturing such improved types of domestic implements as have been evolved in the new conditions of the country.

The Development of the Dried Yeast Industry in Germany

by

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During the last three years a new industry has begun to develop, the products of which are important as food for men and animals, namely yeast drying. Though this industry is still only in its initial stage, it can safely be predicted that it will soon attain an important position in the economy of the country. The interest which German farming circles have shown for the chief product of the yeast-drying industry, namely «feeding yeast» (Futterhefe), is very lively and has led to an increase and improvement in the economic relations between agriculture and the brewing industry which provides the raw material for the yeast drying works.

The drying of yeast owes its origin to the necessity felt by brewers of utilizing in a profitable manner the yeast which is produced in excess during brewing. In order to understand fully the state of the question, a few words on the excess of yeast in the breweries and on its utilization will not be out of place.

In the compressed yeast industry which prepares bakers'yeast, the production of yeast is the object aimed at; consequently here an excess of yeast is practically non occurrent. Just that quantity of yeast is produced which the market will take up. It is quite different in brewing, in which yeast is only a means for the production of beer, and the increase of yeast which occurs during the process of fermentation is only a by-product. A portion of this yeast is used in the brewery itself for the new wort; the greater part however remains free to be utilized in other ways. *The quantity of this excess of yeast in Germany alone may be calculated at* 68 600 *tons per annum.*

The utilization of brewers'yeast has been studied with the greatest interest during the last few decades. The need for a solution of this problem is intimately connected with the development of the two industries: brewing and the making of compressed yeast. When the latter industry did not yet exist, all the yeast required by bakers and by households was supplied by brewers' yeast, which was chiefly the product of high fermentation beer. With the flourishing of the compressed yeast industry, the products of which were superior, for baking purposes, to brewers'yeast, and with the prevalence of low fermentation beers over those prepared by high fermentation, together with the disappearance of many small breweries and the tranformation of the brewing industry into one of large concerns, the sale of brewers' yeast for bakers diminished constantly. At present it may be assumed that of the 68 600 tons of brewers' yeast at most 9800 tons are used by bakers.

Naturally the brewing industry endeavoured to reconquer the lost market: the bakeries; only all attempts made in this direction have failed, as it has not been possible by any treatment to make the brewers' yeast equal to the compressed yeast. Other efforts were made to prepare extracts of yeast to be used instead of meat extracts for the seasoning of food. Although this manufacture succeeded from a technical point of view, it was not possible to find a sufficient sale for the manufactured article; it seems that it is only in England that considerable quantities of brewers' yeast are admitted into the food industry.

Parallel with these efforts one form of utilization was going on and led to good results: *The feeding of fresh yeast to cattle and to pigs.* An especial stimulus to this use of yeast was given by its high protein content, which averages in the dry matter about 55 per cent., and allows it to rank among the best concentrated foods. However, this form of utilization could attain only local importance, as fresh yeast, even after pressing, is easily spoilt and does not stand carriage, especially in summer, to any great distance. So that yeast was only useful to those farmers who lived near a brewery and could get the yeast fresh. It was generally carted off together with the brewers' grains, with which it was fed after being boiled.

The chief object of yeast drying is the full utilization of the excellent feeding properties of yeast and the rendering of them available to all farmers. Only by proper drying can yeast be made to keep good and become a marketable commodity. It is the merit of the Institute for Experiments and Instruction in Brewing of Berlin that this point of view has been recognized and generally adopted as the basis for the full utilization of yeast. When the Institute began its work on yeast drying in 1910, it appeared that in some places yeast driers were already at work (the apparatus of Max Oschatz of Dresden at the Schultheiss brewery, 2nd division, Berlin, and the apparatus of Emil Passburg of Berlin at the Marmite Food Extract Company in London). The Institute organized a prize competition for yeast-drying apparatus, and thus furthered the development of the yeast-drying industry. The results of the competition showed that the German machine industry is capable of meeting the demands made upon it by any industry. All the yeast driers tested at the competition were cylinder apparatus, as they are much used in the industries and especially for potato driers (turning out potato flakes) of which a great number have been set up in Germany. German agriculture may note with satisfaction that the potato-drying industry has been the model which yeast drying has followed. Of the existing yeast-drying systems the greater number of apparatus are built by those firms which have already made a name by their potato driers for producing potato flakes. Also the build of yeast driers is in the main based on the experience gained in the construction of potato driers. The principle upon which all these apparatus are designed is essentially the same. The moist yeast passes over steam-heated cylinders, dries in fractions of a minute on them and is continuously scraped off the revolving cylinders by stationary blades.

The section of alimentary physiology of the Institute of Fermentation Industries in Berlin, to which the Institute of Experiment and Instruction in Brewing is attached, has also supplied the scientific and practical foundations for the practice of feeding dry yeast. Formerly very little was known on this subjert. Now, thanks to the researches of Völtz and his collaborators Paechtner and Baudrexel, carried out in the above section, it is known *that dry yeast is one of the richest concentrated foods, that it is relished and well assimilated by all kinds of live stock, and that it is especially suitable for fattening purposes.* The writer was the first to draw attention to the fact that dry yeast is not one of those foods the price of which corresponds to its calcutated food value (like potatoes, maize, barley) but belongs to those whose price, owing to special dietetic properties, lies considerably higher than their calculated food value would warrant (oats, fish-meal, flesh-meal).

The above researches furnished the following data:

Sheep (1) utilize 94 per cent. of the organic matter, 88 per cent. of the crude protein and upwards of 100 per cent. of the nitrogen-free extract (2) of the dried yeast, which has a higher nutritive value than cottonseed meal.

For *horses* (3) more than half of their grain ration may be replaced by a corresponding quantity of nutritive substance in the form of dried yeast and dried potatoes without prejudice to their health, appearance or performance.

For *pigs* (4) a mixture of dried potatoes, dried yeast and some barley, without any dairy by-products, forms a suitable rapidly fattening ration for young animals.

For *poultry* (5) as regards laying, and for the fattening of *geese* (6) and the quality of their flesh, dried yeast proved equal to meat meal (calculating equal amounts of nutritive units).

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(1) VÖLTZ: *Jahrbuch der Versuchs- und Lehranstalt für Brauerei in Berlin*, 1910, p. 403; and *Zeitschrift für Spiritusindustrie*, 1910, Nos. 48 and 49.

(2) This high utilization figure is due to a better utilization of the basal ration caused by the addition of yeast.

(3) VÖLTZ: *Zeitschrift für Spiritusindustrie*, 1910, No. 47.

(4) VÖLTZ: *Wochenschrift für Brauerei*, 1911, Nos. 45 and 46; *Zeitschrift für Spiritusindustrie*, 1912, Nos. 1-4; *Landwirtschaftliche Jahrbücher*, 1912.

(5) VÖLTZ (Work not yet published).

(6) VÖLTZ: *Wochenschrift für Brauerei*, 1913, No. 11.

With milch-cows (1) the use of dried yeast increases the butter-fat content of the milk.

In numerous cases it could be demonstrated that feeding the mixture of dried potatoes and dried yeast which has been recognized as very suitable, allows of considerable economy in the cost of keeping live stock. (The essential results of these researches are collected in the papers of Völtz, Paechtner and Baudrexel «On the utilization of dried yeast by live stock»: *Landwirtschaftliche Jahrbücher*, 1912).

The excellent results which have attended the practical use of dried yeast have caused such a demand for the new food, especially of late, that the supply has fallen decidelly short, notwithstanding the fact that between 1910 and 1913 the number of yeast-drying works has risen from 5 to 26 (of which 11 are in Germany). Correspondingly to the increased demand, the price has risen in the same period from *8s* or *9s* to *10s 6d* or *11s 6d* per cwt. But the highest limit is not yet reached, because the present price does not correspond to the real value of dried yeast, which consists to a great extent in the increased appetite that this food gives.

The German brewing industry alone is capable of turning out every year about 20 000 tons of this valuable food.

For farmers it will be interesting to learn that they have, often not knowing it, practised feeding yeast for a number of years, when they have used distillers' refuse. This refuse contains all the yeast which forms during the fermentation of the mash. In this connection the following calculation may be made:

100 parts in weight of distillery refuse contain 4 parts of yeast (calculated as compressed yeast). 11 *gallons of this refuse per head of cattle daily contains* 4.4 *lbs. of yeast.* For every 100 gallons of pure alcohol, 400 lbs. of yeast are formed, and as in the German potato distilleries about 61 000 000 gallons of pure alcohol are produced per year *the farms that distil potatoes* feed to their stock about 117 500 tons of yeast, equal to 35 425 tons of dry yeast.

The yeast content of distillers' refuse is not its least valuable part. For those farms which have no such refuse or possess it in insufficient quantity, brewers' dried yeast is a valuable substitute.

The yeast intended for stock feeding is not freed from its bitter principle before drying, but is worked up as it comes from the fermentation vat. The Institute for Experiments and Instruction in Brewing in Berlin has, however undertaken to free the yeast carefully from the hop resin that it contains, in order to prepare it as human food. The work done in this direction has led to surprising results. By means of a competition it has been shown that this purified dried yeast (Food yeast) can be used in the preparation of a number of savoury dishes and renders good service in domestic economy. Experiments made on a number of persons have proved that this food yeast is wholesome and easily digested, and that to a great extent it can replace meat in human food. In the course of these investigations it was ascertained (1) that 1 lb. of this food yeast was equal in food value to 3.3 lbs. of average fat beef. But it is not only an article of food, but, as it has been demonstrated by a number of medical experiments, it is also a means of invigorating weakened organisms.

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(1) Völtz (Work not yet published).

Its power of giving an appetite to debilitated subjects who suffer from inappetence is especially to be mentioned. This specific action of food yeast is perhaps due to its not indifferent lecithin content (N over 2 per cent.). The preparation of food yeast has been for the last eighteen months carried on regularly in a properly equipped purifying and drying installation, and the prepared yeast is daily gaining ground as an invigorating article of food. There is the prospect that this branch also of yeast drying will soon develop to an independent industry. The chief consumption of this food yeast will not be so much in private households as in the food industry, where there is a great demand for savoury material rich in protein. At the present price of 2*s* 2 $^3/_4$ *d* per lb., and considering equal quantities of nutritive elements, food yeast is cheaper than meat. And in the wholesale transactions with the food factories the prices might be considerably reduced.

According to the present state of the technique, all the excess yeast of German breweries could yield a yearly output of 13 750 tons of food yeast, equivalent to about 45 200 tons of medium fat beef. The raw material is sufficient to give rise to an important industry. How much of the excess of brewers' yeast will eventually be put to this use can not be foreseen. For the moment the bulk of dried yeast will be used for the preparation of yeast for live stock, and the production of food yeast will form only a branch of this industry.

It must also be remembered that the use of yeast as food is to a certain extent no novelty, for yeast has always been consumed in the shape of baker's goods, and in considerable quantities too, amounting in Germany alone to 147 000 tons (calculated as compressed yeast) per year, as the 49 000 tons of yeast required by the bakers becomes three times as much in the dough.

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(1) VÖLTZ and BAUDREXEL: *Biochemische Zeitschrift*, 1911, Vol. 30, Part 6; and Vol. 31, Parts 3 and 4.

The Control of the Japanese Fruit Scale *(Diaspis pentagona)* in Italy

by

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The experience of many years has shown that the artificial control measures used against *Diaspis pentagona* are of value only for the season in which they are carried out, and cannot be expected to get rid of the scales permanently or sufficiently to allow of the healthy growth of the plants.

This is the reason of the general complaints about these measures and the doubts entertained by mulberry-growers as to the value of the control, doubts which are all the more in evidence where the disillusion is older, that is where the scales have been present longest.

The natural methods are thus aimed, not at the extermination of the *Diaspis* from its present quarters, as this would be impossible, but at securing an activity sufficient to take the place of the artificial means, even if these were repeatedly and energetically employed, or in other words to prevent the *Diaspis* doing any damage.

Among natural means predatory insects are now no longer considered: indeed it was already foreseen two years ago, when they were first talked about, that they would not be sufficient. The only remaining enemy of any value is *Prospaltella berlesei*, a small species of the Hymenoptera which is the special endophagous parasite of *Diaspis pentagona.* I have already, in two earlier papers (1), described its introduction into Italy and its diffusion in the peninsula during the first three years, 1908 to 1911. We may now discuss the present state of affairs in the control of *Diaspis*. For this purpose it may be well to consider first what is going on in neighbouring countries, namely in Switzerland and over the border of the Empire of Austria-Hungary, where *Diaspis* is present to a serious extent.

In Switzerland it was only last year that *Prospaltella* was imported and let loose, and I have just found that it has established itself in the neighbourhood of Locarno.

In the Trentino (Austria), Prof. Osvaldo Orsi, of the Royal-Imperial Agricultural Institute of San Michele, began importing the insect in 1909; it has since been carefully distributed in the territories of Ala, Riva, Rovereto and Trent, altogether in 12 jurisdictions, comprising 37 communes; it was let loose at 28 centres on 1478 mulberries, and from these it is spreading out naturally or with assistance to all the surrounding trees. The excellent results attained are attested by a pamphlet published by the Provincial Agricultural Council of Trent (bibl. 1), and by several articles in different newspapers, among which I may note one by Prof. Orsi entitled: "La *Diaspis* del Gelso è vinta" (The Mulberry *Diaspis* is defeated), published in the organ of the Trent Farmers' Association (bibl. 13).

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(1) A. BERLESE: La *Diaspis pentagona* e gli insetti suoi nemici. - *L'Italia agricola*, 1911; also *Redia*, Vol. VI, Part 2, p. 298, 1911. ID.: Come progredisce la *Prospaltella berlesei* in Italia - *Redia*, Vol. VII, Part 2, p. 436. (*Author's note*).

In Göritz the spreading of *Prospaltella* was carried out very carefully by Prof. Bolle, who obtained living examples even from Japan. The parasite is now well distributed in many centres and its good effects have recently been described by Prof. Bolle in a study entitled "Die Maulbeerbaumschildlaus (*Diaspis pentagona*) und die Mittel zu ihrer Bekämpfung" (bibl. 8). The Director of the Royal-Imperial Station of Agricultural Chemistry of Göritz, after giving the results of his experiments made in 1910, 1911 and 1912, comes to the conclusions that I had already reached, in particular that *Prospaltella* is an efficient means of controlling *Diaspis*, completely replacing the most efficacious artificial means carefully applied every year.

In Istria *Prospaltella* is now widely spread, according to Prof. Bolle, and the Royal Station at Florence possesses documents showing that it was introduced there in 1909.

The Austrian Government has twice sent competent persons to visit the centres of infection of *Prospaltella* and study its effect; as a result, the Government arranged an extensive distribution of the insect in the Trentino, Göritz, Istria and Dalmatia, as well as to silkworm observatories in Italian territory, and printed instructions, illustrated leaflets, etc., were prepared.

In our peninsula the oldest introductions of *Prospaltella* are at Vanzago, near Milan; Acerra, near Naples; the Palombina, near Ancona; Grottammare in the Marches; and Genoa. Vanzago supplied the bulk of the material for distribution, so that *Prospaltella* has become uncommon there; but all the same *Diaspis* is now very scarce, as the parasite spread naturally from the few infested scales which were left here and there in spite of the most careful search for material. In the country round the scale is abundant, but the parasite has not been assisted to spread. The effect of *Prospaltella* at Vanzago is referred to again in the *Bollettino dell'Agricoltura*, organ of the Lombardy Agricultural Society, for April 11, 1913; to this Dr. Del Bo, travelling lecturer in agriculture at Milan, contributes an article entitled "L'esperienza di Vanzago conferma la bontà della *Prospaltella*." (The results at Vanzago confirm the usefulness of *Prospaltella*). He says that a party of representatives from the Lombardy Agricultural Society, from the Association of Silkworm Egg Breeders, and from the travelling lectureship, were able to recognize that the *Prospaltella* "represents a providential assistance of enormous value against *Diaspis*" and "makes all other methods of control unnecessary." He concludes that farmers should have "unlimited confidence in the new means of control." At Acerra, Sig. Nuzzo's mulberry plantation of 350 fine trees, which were formerly covered with scales, is now quite free, and for two years no attention has had to be given. Further, in all the country round the *Diaspis* is infested or else already totally destroyed. In the Palombina and at Grottammare the destruction of *Diaspis* is complete, and the same may be said at Genoa.

In 1909 other distributions of *Prospaltella* were made all over Italy, and in some forty cases it established itself. In 1910 about 2500 distributions were made, but hardly more than 50 per cent. were successful; this was no doubt due to the feeble numbers sent out, but with so many requests and only two small breeding centres the numbers were necessarily limited. In 1911 over 7600 lots were sent all over Italy, but again for the same reasons the cases of successful establishment were no more than in the previous year.

In 1912 *Diaspis* was very scarce on account of the weather: indeed in Lombardy and Piedmont in particular it had almost disappeared; for this reason little material was sent out, and this was obtained from Venetia and the Trentino, but its quality was excellent. The few hundred lots distributed came largely from Venetia; the successful cases reached 100 per cent., as ascertained by examination on the spot or from numerous samples sent in to the Royal Station.

The next oldest cases of establishment of *Prospaltella* after the ones mentioned above, made with material from these, date from 1909 (summer) and 1910 (spring) and are those already described in the Trentino, as well as a few on this side of the frontier. In all these the destruction of *Diaspis* is now complete from the cultural point of view, and includes a good many acres of land round the first centre of infection.

It is only in Piedmont that the destruction is not everywhere total and equally evident, and in this respect somewhat resembles the results of a year ago in less cold regions, so that we may reckon that even in our most northerly localities *Diaspis* will be completely destroyed in the coming year.

To give an example: in *Il Coltivatore* for Feb. 20, 1913, p. 45, Prof. E. Voglino, director of the travelling lectureships in agriculture of Alessandria, reports on the mulberry plantations of Valenza, colonized by *Prospaltella* at the dates mentioned, and in which "at the end of 1912 the results were amazingly evident, so that there can no longer be the slightest doubt as to the efficacy of the Berlese method for the control of *Diaspis*. On the first mulberry tree colonized by *Prospaltella*, in 1909, I could not find on the 13th of January 1913 a single *Diaspis*, while at the beginning of the treatment it was literally covered with them." In other rows at various distances the parasitization is from 80 to 20 per cent. according to the distance from the original centre. In the woods 300 yards from the mulberries, parasitized *Diaspis* scales can be found on willows.

From Casalmonferrato Dr. Gabotto (bibl. 11) and the staff of *Il Coltivatore* quote observations and figures, and speak well of the work of the parasite.

In Lombardy, Venegono Inferiore (Como) is now completely protected by *Prospaltella*, owing to the work of Sig. Albé, who, with the assistance of the municipality, carried out a planned and regular distribution. At Desenzano the parasite has spread widely, and some areas, up to half a mile in radius round the centres of infection, have been cleared of scales by spontaneous spreading; indeed it may be said now that the infection is general in the neighbourhood. This is stated by Sig. Mazzoldi, of the Chamber of Agriculture there, as well as in the *Provincia di Brescia*, Nov. 29, 1912, and April 17, 1913, and in other Brescia journals of the latter date.

At Salò the *Diaspis* has now been destroyed over several hundred acres about the first centre of infection. In the province of Bergamo Cav. Ambiveri has already largely freed the mulberries at Seriate, Bagnatica and Trescorre, in a radius of about a mile from the original infections, and in other places the travelling lectureship of Bergamo reports similar results (bibl. 9) at Seriate, Cavernago, Boccaleone, Torre Boldone, Gorle, S. Gervasio d'Adda, etc.

For Venetia it is impossible to mention all the places where *Prospaltella* has destroyed the *Diaspis* and followed it up over a large area round the original centre without any assistance; in some cases it has spread over remarkably large areas, for instance more than 75 acres in just over two years at Fregona (Vittorio-Veneto) (bibl. 15), and a similar area in less than two years at Bovolone (Verona). It will suffice to say that complete and extensive destruction of *Diaspis* can be seen in the Province of Treviso: at Campocroce, Porzano, S. Lazzaro, Fregona, Valdobbiadene (1), etc.; in the Province of Udine: at Codroipo, Cividale, Ipplis, Faedis, Manzano, S. Giovanni di Manzano, Latisana, Colloredo, Sacile, Caneva di Sacile, S. Vito al Tagliamento, etc., to give only the names of the chief centres; many of these include several communes, Latisana, for instance, referring to some twenty localities; in this connection the travelling lecturer for Eastern Friuli writes me (March 11, 1913) that he has let out *Prospaltella* in 26 communes in his district: " In examinations on the spot in the last few days ", he writes, " I have been able to observe new miracles of spreading: commune after commune completely invaded ".

In a recent article in the *Giornale di Udine* (April 17, 1913 — bibl. 20) Prof. Panizzi (the above mentioned lecturer), speaking of *Prospaltella* in the districts of Latisana, Palmanova and Codroipo, declares that as a result of a single infection in 1909 there are now thousands and thousands; and that "a not inconsiderable number of growers can from their own experience bear witness to the efficacy of this convenient means of destroying *Diaspis*," and if artificial means of control are not used "within the year *Diaspis* will have disappeared from numerous large centres and in two or three years from the whole district."

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(1) The effect is pointed out in the instructions for the diffusion of *Prospaltella* in 1913, issued by the travelling lectureship (bibl. 22). It is stated: Our experiments from 1909 on show clearly and decisively that *Prospaltella berlesei* destroys *Diaspis pentagona* so completely as to render it culturally harmless. (*Author's note*).

In all these cases it is not a question of only the single mulberry tree which was colonized nor yet of just a few near it, but of vast zones of land, and generally of whole communes. As an example I may mention the case of Ipplis, from which the deputy-mayor writes me: "Nowadays we hear nothing of *Diaspis;* its ravages are merely a matter of history".

In all the other Provinces of Venetia the state of affairs is much the same as in the two mentioned, except that the proportion between the centres of *Prospaltella* infection and those of *Diaspis* infestation is not always the same. The whole list is too long to quote, but the following may be mentioned: Mira and Mirano in the Province of Venice; Este, Cittadella, Bassano, Due Ville and Nosedo in the Province of Verona.

All these examples agree perfectly with the result predicted for the work of *Prospaltella* within two years of its introduction into a place, that is the total destruction of *Diaspis* as an agricultural pest in a zone of greater or less extent round the centre of colonization. The most satisfactory fact as to the value of the parasite is the ***unanimous*** conviction to this effect, now firmly rooted and warmly expressed, of all the landowners and countrymen who have had the benefit of *Prospaltella* for their mulberries since at least 1910.

In almost all the places in which the parasite has been introduced at least two years the following occurrence noted by Prof. E. Voglino is being repeated: "The countrymen about Valenza have got to recognize the parasitized scales perfectly, and as they all have small properties, they pick out at pruning time twigs with plenty of scales and their parasites on them, and take them to fasten on their own trees". (*Il Coltivatore,* Jan. 20, 1913, p. 46). Prof. Gastine, (referred to below) states that in some parts of Venetia the countrymen who have got material infected by *Prospaltella* make a regular trade of it, selling twigs of a foot long with 60 to 80 per cent. of parasitized scales for 5*d* a piece. So great is the demand, that in March many fortunate owners of parasitized mulberry trees had to watch them at night to prevent the material being stolen.

The condition of these less recent introductions is well reflected in the following sentences by Prof. Gastine, who was sent by the French Government to study the conditions as regards *Diaspis pentagona* in Italy (letter to Prof. G. Del Guercio, under date Nov. 26, 1912):

"I have made a long journey in Italy..... to visit places where I could examine the results obtained against *Diaspis pentagona* with *Prospaltella berlesei.* After going to Vanzago I went on to Udine, then into Göritz, to Trent, etc. I also made interesting journeys about Milan, and to Casalmonferrato.

"Everywhere I found the *Diaspis* attacked by *Prospaltella berlesei* and here and there in considerable quantities. Professors and growers alike were enthusiastic about Berlese's method, especially at Trent, and in Venetia at Codroipo, S. Vito del Tagliamento, etc. Remarkable results can also be seen at Casale Monferrato.

" After this long enquiry I return thoroughly persuaded that *Prospaltella* can control the *Diaspis* efficaciously from the cultural point of view ".

The requests for material infected by *Prospaltella* received this spring were truly enormous ; the mulberry twigs with *Prospaltella* parasitization sent out this March by the Institute number 25 365 for Venetia, 5105 for Lombardy, 3520 for Piedmont, 1520 for Emilia, 80 for Liguria, 315 for Tuscany, 200 for the Marches, 1020 for Umbria, 50 for the Abruzzi, 30 for Latium and 110 for Campania ; total 37 315.

Besides this, thousands of lots of infected material are being spread about on the spot by the possessors of the older and richer breeding-grounds; to quote an example, the Hon. Count Rota, who had a single lot in 1909, obtained about 100 in 1910, about 500 in 1911 and 35 000 in 1912; with these he infected half his own mulberries and distributed a great lot gratis to his acquaintances, while this year he has abundance for himself and others. When we consider examples of this sort and that there are several dealers in silk eggs and silkworm observatories who breed *Prospaltella* to send out to their clients (1); also that there are agricultural bodies which, although possessing as much as 6 cwt. of infected branches, are so overwhelmed by requests that they have to apply to our nurseries for more; and lastly and most important, that the parasite spreads by itself in a single year over acres and acres of land under mulberries, it is easy to see how near is the time in which all that will remain of *Diaspis* is an unhappy memory.

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(1) For example, one of these wrote me on Feb. 14, 1912: " I have thus sent out about a thousand lots, and am in no doubt about the results ".

For 1913 we may quote the cases of only four firms in the province of Treviso who breed silkworm eggs: Cav. Mozzi, who has distributed 2000 lots; Sig. Zanetti, rather more than this number; Sig. Bidoli, 1500; and Sig. Fabris, of the Motta Estate, who sent out 3000.

Besides this there are the thousands sent out from the lectureship of agriculture of the same province: those sent by Prof. Sacchi, Director of the Provincial-Agricultural Institute of Treviso, actually exceeded 9000 ; Prof. Jelmoni, lecturer at Conegliano-Vittorio, over 2000; Prof. Di Gaddo, lecturer at Oderzo, 1000, etc. From this it will be seen how justifiable is the opinion of Prof. Sacchi, who wrote me on March 14, 1913: " from the infections already made and their complete success, as well as from the great number which I can undertake this year, I think I shall not be far wrong in predicting that a couple of years hence *Diaspis* will no longer be talked of in my district."

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(20) La *Prospaltella* nei distretti di Latisana, Palmanova, Codroipo. — *Giornale di Udine*, Year 47, No. 106, p. 2. April 17, 1913.

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SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

441 – **The Project of the Ministry of Agriculture of Hungary regarding the Reclamation of the "Puszta Hortobágy".** – BALKÁNYI, BÉLA: in *Mezőgazdasági Szemle*, Year XXXI, No. 3, pp. 125-131. Budapest, March 1913.

The Ministry of Agriculture is at present occupied with a scheme for reclaiming the extensive «Puszta Hortobágy», the largest of the steppes of the vast Hungarian plain (Alföld), and belonging to the municipal town of Debreczen. This great «puszta» is 59 700 acres in extent, and for centuries has only been used for grazing. The grazing rights are determined by an old statute in such terms that the inhabitants of Debreczen alone are entitled to use the land as a pasture on payment of a tax fixed by the general assembly of the town. The present system of using the pasture does not in any way fulfil the demands of modern agricultural progress, in that the virgin soil of the «Hortobàgy» only serves as an indifferent grazing ground for two or three months of the year.

Seeing that the present management of the «puszta» is not satisfactory and cannot meet economic requirements, the General Assembly of the town of Debreczen, after having offered opposition for many years, finally acceded in March 1912 to the project of the Ministry of Agriculture relating to the systematic reclaiming of the «Hortobàgy», a scheme which was met by desperate resistance on the part of the small land owners of Debreczen, who did not wish to sacrifice their traditional rights to the modern evolution of agriculture.

The scheme embodied in the contract of the Ministry of Agriculture includes:

1) The reclaiming and dividing up of 17 000 acres for intensive cultivation and the erection of farm-buildings.

2) The creation of experimental irrigated State pastures, 4 250 acres in extent.

3) The improvement of the rest of the « puszta » for pasturage, the putting into effect of a new grazing regulation and the reorganization of stock-breeding.

The town of Debreczen has invited the service of the Ministry of Agriculture to mark out the above-mentioned extent of land for intensive cultivation and, at the same time, to determine the method of its division into leased farms.

The early realization of this reclamation scheme is the more desirable for the whole nation, seeing that it will mean a considerable increase in agricultural products, and, above all, lead to much improvement in stock-breeding in Hungary.

442 - **A Ministerial Decree of November 30, 1912, regarding the Promotion of Rabbit Breeding in Prussia.** - *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 2, p. 23. Berlin, February 1913.

The decree sent to the Chambers of Agriculture advocates the encouragement of rabbit rearing in future for food and not for purposes of sport.

In the first place, those Rabbit Breeding Societies which aim at increasing and promoting the remunerative possibilities of rabbit-breeding and keeping should receive help from the Chambers of Agriculture.

This assistance might take the form of grants to enable these societies to establish covering stations, to combine for the purchase of doe rabbits, and to erect suitable hutches. The Minister of Agriculture advises the keeping of only a few breeds, and those the best flesh producers.

443 - **Proposed Law on the Production of Wine and on the Wine Trade in the Republic of Uruguay.** — *Revista de la Asociación rural del Uruguay*, Year XLII, No. 1, pp. 52-59. Montevideo, January 1913.

The executive submits to the Senate and to the Chamber of Representatives the proposal of a law of which the following are the chief provisions: Prohibition of the manufacture of artificial wines (natural wines are defined as those obtained by the alcoholic fermentation of the must of fresh grapes); complete liberty in the correction of natural wines; compulsory use of sealed vessels (bottles, demijohns, barrels, etc.) for all sales to the consumer; institution of officials provided with the necessary plant for the settlement of disputes between producers and the State, and for the study and the spread of good enological methods; prohibition of all blending of national wines with imported wines; increased taxation on foreign highly alcoholic wines.

The proposed law is followed by some information supplied by the " Comisión de Hacienda," from which it is seen that in 1912 there were in the Republic 2246 vine growers; 15 106 acres under vines and 23 700 000 vines, which produced 41 360 000 lbs. of grapes, yielding 2 321 000 gallons of wine. On account of the unfavourable weather prevalent during the year the crop was only about two-thirds of a normal crop.

444 - Encouragement to Farming and Stock Breeding in the State of Colima, Mexico. — *El Agricultor*, Year VII, Vol. VII, No. 73, pp. 625-626. Merida, January 1913.

By the Government Decree No. 25 of December 25, 1912, a bonus of 5 pesos (about 10 shillings) is granted for every thousand fruit trees that are planted by any farmer or native or foreign company that will devote itself, after the publication of this Decree, to the planting and cultivation of fruit trees. This bonus will be paid when the first crop of fruit is gathered. All kinds of fruit suitable for exportation may claim the bonus. Thus at present the following are included: lemons, oranges, tangerines, avocado pears, chestnuts, mammee apples, raspberries, custard apples, mangoes, walnuts, apples, cherries, pears, peaches, quinces and olives.

A bounty of 5000 pesos (about £ 500) will be given to the farmer or native or foreign company that will plant and cultivate up to the gathering of the first crop two hundred thousand bananas of the Roatán type. Farmers who dispose of only 12 to 25 acres of land and who plant the whole of them with the above variety will get a bonus of 15 pesos (about 30 shillings) for every thousand plants. The following bounties will also be given: 2000 pesos (about £ 200) for every 200 000 stone pines (*Pinus pinea*) that are planted, and proportional sums to small landowners who will plant upwards of 10 000 such trees; 50 pesos (£ 5) for five years for every hectare (2.47 acres) of land under vegetables consumed in North America such, as onions, garlic, tomatoes, egg-plants, artichokes, cucumbers; 5000 pesos (about £ 500) paid down once to whoever lays down 750 acres to canteloup melons.

For five years the land devoted to the above mentioned crops will be free from land taxes and the buildings used for packing the fruit or storing packing material will be free from State and municipal taxes. Banana meal factories will enjoy the same exemption.

All the irrigation works erected in future shall be free from taxes for ten years. Neither the amount of capital employed nor the greater value thus acquired by the land will be taken into consideration.

10 pesos (about £ 1) will be paid once for every hectare (2.47 acres) of land planted to vines and 20000 pesos (about £ 2000) will be paid once for the planting of 100 000 coconut palms, and smaller proportional bonuses will be given to small landowners for every thousand coconut palms that they plant. On all urban holdings in the capital and in the principal centres of the State, which possess four coconut palms in bearing, the taxes will be reduced by one half and for five years. A reduction of taxes to the amount of 100 pesos (about £ 10) per thousand coconut palms will be granted to those landowners who will plant, on both sides of the railway from the station of Alzada to the port of Manzanillo, three rows of palms 26 feet apart and the same distance in the rows. This reduction will be allowed for the five successive years following the one in which the palms begin to bear.

A sum of 5000 pesos (about £ 500) is allowed to the executive for surveys in view of the sinking of artesian wells.

The first factory erected in the State for the treatment of fibre produced in the State itself will be free from any State or municipal tax for five years.

National or foreign capital invested in the breeding of improved breeds of cattle, horses, mules, goats, sheep, pigs or poultry will be exempt from any tax for ten years, and for five years if invested in agricultural machinery, decorticators or forage balers.

The executive is empowered: to take the necessary steps to ensure the subdivision of landed property while the general agricultural law is being carried out, and to promote the foundation, as soon as possible, of a mutual agricultural bank especially in the interest of small farmers.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

445 - **The Economy of Agriculture in Great Britain.** CAMPBELL, P. P.: in *North British Agriculturist*, Vol. 65, Nos. 7 and 8, pp. 108, 123, 140-141. Edinburgh, February 1913.

The writer gives a short description of the first beginnings of agriculture in general, and especially in England, and speaks of the influence which has been exerted by science, industry and legal enactments upon the development of agriculture in Great Britain right up to the present time. In his opinion, agricultural prosperity can only be attained by repopulating the country districts and extending the cultivation of cereals.

446 - **Agricultural Products of the French Tropical Colonies.** — BAILLAUD, E. (Secretary General of the Colonial Institute of Marseilles) in *Voordrachten over Koloniale Onderwerpen gehouden ter Gelegenheid van de Koloniale Landbouwtentoonstelling te Deventer*, pp. 143-167. Deventer, January 1913.

French West Africa. — The most important product of this group of Colonies is the earthnut; the exports of this crop, chiefly from Senegal, having remaind stationary for almost a century, suddenly began to increase when the country was opened up by the railway and more than quadrupled in 15 years, reaching 231 200 tons in 1910; this amount is probably liable to further increase as communications are established with other parts of the interior.

The exports of palm nuts and oil, which come chiefly from the Ivory Coast and Dahoney, have also increased in the last few years since the railways were established. They were 20 250 tons of oil and 44 080 tons of nuts in 1910, it and the products of this industry will reach a much higher figure when the primitive and wasteful processes of the native cultivators are replaced by more scientific methods. Other exports which may be mentioned are:

Rubber: 12 430 000 lbs. (1910); a product of high quality and increasing in quantity every year.
Gum: to the value of £148 500 (1908).
Mahogany: 13 560 tons (1910).
Maize: 2 022 tons (1910).
Horns, Skins, and Wool.

Equatorial Africa. — This group of colonies has not prospered as well as the former group owing, no doubt, to the fact that the land was divided up and granted to 20 land companies; a large number of these were failures, for they confined their attention to exporting the more easily obtained products of the country, such as rubber and ivory, without attempting to develop its other resources. New arrangements have now been made with the Land Companies and free trading established. Cocoa and coffee have been planted, but the results of this change are hardly evident yet in the export figures. In 1910 these were as follows: ivory to the value of £ 120 000, rubber £ 7 600 000, timber £ 120 000.

Indo-China. — Here rice is the staple product of the country, and forms over three-fifths of the total exports (1 249 000 tons in 1910). The crops are chiefly raised by natives, and then pass into the hands of Chinese middlemen and from them to the decorticating and bleaching factories. These also are exclusively controlled by Chinamen, and as the latter are somewhat given to speculation, crises in the industry are not infrequent and have an unfavourable influence on the prosperity of the country as a whole. Maize has also become an important export of late years, and in 1910 82 920 tons were shipped to France, where a preferential tariff secures a good price for it. Rubber, though exported in almost negligible quantities at present, is being planted largely on the "red soils" of Cochin-China which are specially adapted to its culture, and where it is estimated that it can be produced at 1 shilling per lb. Cassava, skins, silk and spices make up the remainder of the exports.

Madagascar. — Up to 1895 imports and exports were low, and counterbalanced one another, but at that date capital began to pour into the country and is now beginning to bear fruit as evidenced by a greatly increased production. In 1911 the exports had risen to £ 1 800 000 and exceeded the imports. This development is due to a large extent to the exploitation of native industries, but instead of being carried on by large land companies as in the African Colonies, it is the result of the personal enterprise of individual colonists. On the East Coast the latter are numerous and have now established nearly 700 plantations, most of which are producing vanilla. On the High Plains, colonisation has been less successful; coffee has proved a failure and the field has now been abandoned to native cultivators. On the West Coast, a good deal of land has been taken up by Europeans, and in many cases plantations of various kinds show signs of prosperity, but the major part may be considered as still in the experimental stage and it is difficult to predict the future from their results. Probably a system of subleasing the land to native cultivators with a division of profits will prove the most successful for this part of the country. Animal produce (including live and dead meat), mangrove bark, Cape peas (Pois du Cap) cassava, rice and vanilla are the chief exports at present, but undoubtedly several other tropical products, such as coffee, cloves, cocoa and coconuts, will shortly be exported in considerable quantities.

Amongst the older colonies, *Reunion, Martinique* and *Guadaloupe* are cultivated in an intensive manner, producing sugar, vanilla, coffee, cocoa, essential oils and cassava. Their population consists chiefly of the descendants of liberated slaves, and is somewhat lacking in energy and out of date in its methods of working; but with the introduction of modern scientific methods these islands should be capable of still further development.

447 - **The Condition of the Military Territory of the Chad at the Beginning of 1912.** — LARGEAU: in *Renseignements Coloniaux et Documents*, No. 2, pp. 73-91. Supplement to *L'Afrique française*. Paris, February 1913.

Information respecting stock-breeding and agriculture; the former is already furnishing considerable resources. The writer gives a table and figures dealing with the breeding of horses, sheep, cattle, camels and ostriches. With regard to agriculture, the chief cereal produced in the territory is millet; the following are also grown: earthnuts, sesame, maize, rice, Kanem wheat and lastly the Karité tree. Abundant and excellent hay is produced.

448 - **Agriculture in Paranà.** — SANTOS, E. in *A Fazenda*, Year IV, No. 32, pp. 2-6, Rio de Janeiro, January 1913.

The State of Paranà, with an area of 92 500 square miles may be divided into two belts: the coast, possessing a sub-tropical climate, and the high lands (from 650 to 3900 feet above sea-level), which enjoy a climate equal to that of the south of Europe. These latter include: 1) the plateau of Curityba; 2) Campos Geraes, a great extent of pastures studded with woods; 3) the plateau of Guarapuava consisting of excellent pastures; 4) the valleys of the Ignassù, Jejuiguassù, Pequiri and S. João rivers; 5) the valleys of the Ivahi and Tibagi, covered by rich forests. In the whole of the State the temperature ranges from 4 to 32° C. The network of streams is very extensive and is capable of supplying considerable quantities of power; thus, for instance, the fall of Sete Quedas or Guayra on the Rio Paranà could produce 80 millions H. P., and the Iguassù fall 14 millions (the Niagara falls supply 3 500 000 H. P.).

There is in the State a " Secretaria de Agricoltura ", it is divided into two sections: 1) Agriculture and Industry; 2) Inspection, Control of Pests and Agricultural Education. There is an Experimental Agricultural Institution at Baceachery near Curityba; a Station of Animal Husbandry at Ponta Grossa; and an Agricultural and Stock-breeding Station of the " Sociedad Agricola e Pastoril Central do Paranà," founded in June 1909. The chief agricultural products of the country are: maté, of which 99 501 043 lbs., worth £ 1 696 040, were exported in 1910-11, mostly to the Argentine Republic, Chile and Uruguay; timber, of which 27 963 681 cub. feet, worth £ 172 706, (1) were exported in 1909 from the ports of Antonina and Paranaguà, and timber of trees other than *Araucaria brasiliana* to the value of £ 17 211 coffee; bananas; pigs, salted meats; cattle; horses and mules; hides. Silkworm rearing is developing regularly. During the last ten years 500 000 bunches of bananas were exported to France from the ports of Southern Brazil; in November 1912 28000 bunches were exported from Rio della Plata and 23000 from Santa Caterina.

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(1) The milreis being taken at 18 *d*. (*Ed.*).

449 - **Agriculture and Irrigation in the Valley of Ica, Perù.** — *Peru To-day*, Vol. IV No. 9, pp. 481-490. Lima, December 1912.

As there is no rainfall on the coast of Peru, cultivation is only possible with irrigation. At present the cultivable area is not more than 640 000 acres, including 82 000 belonging to the valley of Ica. of these 45 000 are under actual proprietorship, 30 000 acres being cultivated.

The climate of the valley is mild and healthy. The temperature rarely exceeds 90° F. (26.6°C.) or falls below 46° F. (6. 6° C.). During the winter and spring months there are heavy fogs and dews. During the summer months from January to April the Ica river brings down an average of 230 000 000 cubic metres (practically 190 000 acre-feet) of water, equivalent to 775 second-feet. But the fluctuations are so extreme that though the total canal capacity is about 60 cub. metres (2 120 cub. feet) per second they are not sufficient to utilize the whole of the flow.

The erratic conditions of flow have given rise to the same method of irrigation as that practised in the delta of the Nile. This method consists in catching in the canals as large a portion of the floods as is practicable and distributing it as quickly as possible in relatively large volumes over the entire area to be irrigated.

The cultivated areas are arranged in basins which are inundated to an average depth of about 16 inches at each irrigation. The upper lands of the Ica valley receive two such irrigations a year, the lower lands frequently only one. Nevertheless these lands, abont 30 000 acres, produce for exportation about £. 150 000 worth of agricultural products per year.

The substructure of the valley is formed by a deposit of water-bearing sands and gravels over 500 feet deep and confined between masses of impermeable igneous rocks. The water table varies in depth from 3 to 20 feet, and wells sunk to a depth of 100 feet below the surface of the water table will give during 3 or 4 months of the year, at least 22 gallons of water per minute for every metre (3ft. 3 in) that such wells are sunk below the water table, provided that they are properly spaced. C. W. Sutton C. E., Chief of the Irrigation Service of the Peruvian Government, calculates that 30 of these wells would not cost more than £. 130 000 including pumps and connections, to which should be added £. 50 000 to provide the power installation and distributing system for power, and £. 20 000 to provide the distributing system for water. The cost of operation might be reduced by using the power for other purposes during two-thirds of the year when not required for pumping, and by using as fuel the wood of the cotton plants which is to-day burned on the fields.

With the actual system of irrigating only in summer, 242 to 273lbs. of Peruvian cotton are produced per acre while if American cotton were sown and irrigated in spring it would produce at least twice as much. The amount of well water necessary for this advantage is only one-eighth of the total quantity required to produce a crop.

During the occupation of the valley by the Spaniards the lands that were under cultivation comprised principally vineyards; some of these still exist, where vines 150 years old are still producing fruit at the rate of 4 tons to the acre, and in a valley where there is an utter absence of all vine plagues. At present however, the principal and most profitable crop is cotton. The production of the valley, including Palpa and Naczsa, is about 50 000 cwt.

The cotton now grown is of two classes, the native Peruvian and American Upland, erroneously called in Peru Egyptian. The former produces 240 lbs. of clean cotton per acre, and that after eighteen months from planting, as against 475 lbs. per acre of the American plant after 5 to 6 months' planting. The latter has also the advantage of maturing earlier, thus escaping injury from low temperature, and of costing somewhat less to pick. For these reasons American Upland is rapidly taking the place of Peruvian cotton.

The plants usually interspersed with cotton in Ica are: Lima beans (*Phaseolus lunatus*), harvested in November, yielding from 60 to 80 sacks of 200 lbs. each per acre and worth 24*s* per cwt.; maize, sown in February and harvested in June, yielding about 10 sacks of 200 lbs. each per acre and sold f.o.b. Pisco at 6*s* to 10*s* per 100 lbs.; chick peas, sweet potatoes and *yuca*. The above results are obtained from such crops as have been irrigated only at the time of tilling the land and sowing. Where cotton is sown, the yield of these by-products is less than here given.

Besides the above-mentioned plants, in this valley fruit trees thrive in abundance; they are chiefly date-palms, figs, bananas, oranges, alligator pears, mangoes, custard apples and carob trees. The latter are only found in Peru in the departments of Piura and Ica. A young tree yields about 20 sacks of 100 lbs. each, worth 3*s* per sack. The bean, besides being a very valuable forage for animals is also used for making a strong tonic wine (algarrobina), as well as sweets. The wood is very hard and durable; it does not rot and is extensively used in building construction, and for railway sleepers. No sugar has ever been grown in this valley, but in certain northern zones of Ica experimental plantations of sugar and of rice have given such good results that their culture will shortly be established on an important scale.

Mr. Charles H. T. Townsend, entomologist to the Peruvian Government, furnishes the following information.

« The white scale of cotton which has constituted a serious plague for some years in the North of Peru is absent from the Ica region.

The cotton leaf caterpillar exists throughout Peru but is easily controlled by arsenical preparations if applied early.

« The cotton square weevil is present throughout the cotton districts of the Peruvian coast strip, but as it can persist as a plague only under conditions of considerable humidity, it remains inactive for several months at a time, the severity of its injury being thus greatly lessened ».

450 – Agricultural Conditions in Bohol, Philippine Islands. – SOUTHWICK, E. I.,

The Philippine Agricultural Review, Vol. VI, No. 1, pp. 34-39. Manila, January 1913.

This paper gives a general description of the island of Bohol and of the chief crops grown there : corn [maize] is grown very generally throughout the island and constitutes the principal food of the people ; rice is sown on dry soil and transplanted to terraced paddies ; tobacco is not as important a crop as it should be ; sugar cane for the market is grown chiefly on the fertile plains between Tubigon and Calape ; coconuts are grown for copra and tuba especially ; Manila hemp and maguey are not much grown. The most common fruits are bananas, mangos, and papayas; chicos and pineapples are produced in limited numbers, while citrus fruits are very little grown. Guava grows wild everywhere, but it is not cultivated. Camotes are the vegetables most grown ; they are not attacked by locusts. Mungos are usually planted among maize. The grazing of carabao and cattle is chiefly practised on the northern plain.

RURAL HYGIENE

451 – The Relation Between Land Reclamation and Malaria. – ROSSI, GIACOMO.

Grande e piccola bonifica nel Mezzogiorno, pp. 8. Naples, 1912.

According to the Parliamentary Report of 1906, the land to be reclaimed in Southern Italy is divided as follows :

	acres
Molise	18 321
Caserta Province	44 359
Benevento Province	481
Near Naples	2 049
Near Salerno	37 807
Reclaimed land of the Nola torrents *	35 419
Foggia Province	89 581
Lecce Province	12 351
Basilicata	11 458
Cosenza Province	66 080
Catanzaro Province	20 033
Reggio Calabria Province	11 884

* In this case it is only a question of the regulation of torrents, without any hygienic object.

Thus there are in Southern Italy 380 918 acres to be reclaimed, or rather in the course of reclamation, since schemes have been made, funds allotted, and in some cases the work is in course of completion. At present large operations are in progress in the lower basins of the

Volturno and the Sele. Nevertheless, the malarial zones are much more extensive than the areas, to be reclaimed. As a typical example of this, the writer cites Apulia, where only about 103 000 acres require reclaiming out of an area of 5 907 000 acres, and where there are 184 malarial communes as against 53 free from the disease. Except in the vine-growing districts (723 000 acres) extensive cultivation predominates here. Further, it must be noted that marshes almost always represent but a very small fraction of the land to be reclaimed, which also includes the reclamation radii, *i-e* land which will derive hygienic benefit from reclamation. Thus, in the plain of Eboli, the marshes are only 4 016 acres in extent, while the reclamation radius includes 86 765 acres.

It is therefore inaccurate to establish a direct connection between marshes and malaria, and an illusion to believe that large reclamation operations would suffice to bring about the disappearance of malaria. "The severe malaria which prevails in so many southern districts is not due to existence of true marshes and swamps, but to the want of an intense and systematic cultivation of the soil, to the neglect of the land, to the absence of drainage ditches and of deep ploughing, all causes of the spread of malaria, since they easily permit of the temporary and permanent accumulation of stagnant water on the surfage of the soil and the consequent development of *Anopheles* larvae.,. Thus, the agricultural and hygienic renaissance of the South depends less upon large then upon small reclamation operations " on the reclamation wrought by the field ditch and the spade.,,

452 - **Grants for Agricultural Education and Research in England, 1911-12.** - *Board of Agriculture and Fisheries. Annual Report on the Distribution of Grants for Agricultural Education and Research in the Year* 1911-1912, pp. 112. London, 1913.

EDUCATIO
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AGRICULTURE
AND FORESTI

On January 19, 1912, revised arrangements were made between the Board of Education and the Board of Agriculture and Fisheries, the effect of which is to place Agricultural Education under the supervision of the latter to which is now assigned the responsibility, not only for Universities and Colleges in which advanced work is being done, but also for Farm Schools and other provision for Agricultural Education on a lower plane than that of the Agricultural Colleges, which formerly were under the supervision of the Board of Education.

In the financial year 1911-12, the grants awarded in aid of educational institutions amounted to £18 840, The accounts sent in by the Local Authorities of the different counties, and which refer chiefly to 1910-11, show that they are spending in round figures a total of £80 000 per annum on Agricultural Education. The report gives a detailed account of the different grants and the objects to which they were devoted.

On August 10, 1911, the Development Commissioners recommended the Treasury to make the Board a grant for the furtherance of research in Agriculture; the Treasury approved the recommendation, and in a letter dated August 21, 1911, authorised the Board to give effect to the

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On August 10, 1911, the Development Commissioners recommended the Treasury to make the Board a grant for the furtherance of research in Agriculture; the Treasury approved the recommendation, and in a letter dated August 21, 1911, authorised the Board to give effect to the scheme agreed upon, which included the improving of agriculture by providing technical advice for farmers. The general character of the scheme was indicated in a Circular issued by the Board on August 25, 1911. In order to secure the services of a number of carefully trained men for work in connection with the scheme, the Board proposed in each of the years 1911, 1912, 1913 to offer 12 scholarships of the value of £150 per annum tenable for three years. Having regard to the institutions available as centres, the Board arranged the counties of England and Wales in 12 "provinces,, and have obtained a grant of £12 000 per annum from the Development Fund, which will be employed in providing trained specialists in each area.

A sum, not exceeding in the aggregate £30 000 per annum, has been set aside to provide aid for two Research Institutions for Plant Breeding, two for Animal Pathology, two for Agricultural Zoology, one Research Institution and two or three local experimental gardens for Fruit Growing and one Research Institution for each of the 11 groups of subjects mentioned, other than Animal Breeding. A sum, not exceeding £3 000 per annum, will be given in Special Grants for Research. "Interim Grants,, to the amount of £9 263 were made to various Institutions from 1911-1912 to assist in the continuance of work already begun. The Treasury has sanctioned a payment from the Development Fund of £12 000 per annum to be distributed as grants for the purpose of assisting certain Institutions in England and Wales to supply technical advice to farmers and to provide for the investigation of local agricultural problems. The Board draws attention to the fact, that in order to gain the confidence of the farmers, it is necessary to convince them that the Staff of such Institutions is able to advise, not merely in regard to the general principles of cultivation and management, but also as to difficulties which lie outside ordinary experience and may need exhaustive investigation and patient research.

The Report gives as Appendix I, an account of the constitution and work of each Agricultural Institution which receives a grant, and the memoranda connected with the scheme are given *in extenso.*

453 - **The Practical Rural Economy of the Royal Agricultural Colleges and Agricultural Schools in Hungary, 1909-1911.** — NYÁRÁDY, JÁNOS.: in *Köztelek*, No. 23, pp. 805-806. Budapest, March 22, 1913.

For about four years the State Agricultural Schools and Colleges have been endeavouring to increase their revenues as much as possible, both with a view to augmenting their receipts and also to afford their students a practical object lesson.

The writer sets forth (according to the very carefully kept books of these institutions) the system of agricultural economy practised by professional institutions in general, their stock of cattle, implements, crops and revenues, as well as their budget and the balance of agricultural operations during the period 1909-1910-1911.

There are 5 State Agricultural Colleges and 19 Schools in Hungary. The total area cultivated by these institutions is 15 767 acres, of which 2 366 acres belong to the State, 5 172 acres are placed gratuitonsly at its disposal by private individuals, and 8 228 acres are rented.

The institutes have proved that there is no bad soil, having brought into bearing completely exhausted soils (belonging to the second category above) by means of long and costly operations of clearing and improvement.

Of the total area, 11 916 acres are under farm crops, 394 acres are gardens, 2 867 acres are forest, while 354 acres are worked by the students and 236 acres are turned to varions uses. There are 7 867 acres of arable land, of which the following areas have been manured:

	Farmyard manure	Chemical manures
	acres	acres
1909	1 506	178
1910	1 537	747
1911	1 688	1 158

The use of chemical manures is becoming increasingly general. The following table gives the yields per acre of the chief crops:

Year	Wheat	Rye	Barley	Oats	Maize in cob	Mangold	Potatoes	Lucerne hay	Clover hay	"Three Months" hay (1)	Dry maize for forage	Meadow hay
	bu.	bu.	bu.	bu.	lbs.	tons	tons	cwt.	cwt.	cwt.	cwt.	cwt.
1909	18.2	27.6	29.3	35.8	24 80	16.0	3.8	30.0	20.7	22.8	42.9	11.1
1910	22.0	25.3	18.9	19.0	31 20	18.8	5.0	36.4	24.0	22.5	41.1	19.5
1911	20.6	27.0	24.5	37.0	24 80	13.3	3.9	30.4	19.3	23.2	35.3	16.2

(1) A mixture of vetches and cereals. (*Ed.*)

The cereal crops are used primarily to supply the various institutions, the surplus being kept for seed or else sold.

The total number of live stock was as follows.

Year	Horses	Draught oxen	Oxen for fattening	Breeding cattle	Sheep	Pigs
1909	328	386	43	1 220	2 864	1 185
1910	330	365	47	1 256	3 024	984
1911	357	393	37	1 357	2 866	983

This total was somewhat modified during the three years by purchases from abroad and at home; in order to meet present requirements, the Institutes are about to acquire first-rate breeding stock of all kinds.

The total capital of the Institutes increased by £ 16 170 from 1909 to the end of 1911. It was divided between the three years as follows:

Year	Land		Buildings		Dead Stock		Live Stock		Production	
	£	s	£	s	£	s	£	s	£	s
1909	81 485	4	59 506	8	15 921	3	30 185	12	10 375	17
1910	82 054	16	61 537	14	18 197	0	32 237	1	21 695	6
1911	80 915	11	66 060	13	19 187	1	35 662	11	25 576	18

The following is the balance of the three years.

Year	Gross Revenue						Total Expenses		Net revenue				Deficit			
	Total receipts		Increase of capital		Total gross revenue				Total		per acre		Total		per acre	
	£	s	£	s	£	s	£	s	£	s	s	d	£	s	s	d
1909. . . .	22 424	8	4 410	12	26 835	0	25 232	8	—		—		1 397	8	2	4
1910. . . .	25 346	4	12 503	1	37 849	5	31 623	19	6 225	6	10	5	—			
1911. . . .	32 304	7	9 161	3	41 465	10	32 401	2	9 064	8	15	2	—		—	

454 - **The Agricultural College at Grignon (France).** BRETIGNIÈRE, L. : in *La Vie agricole et rurale*, Year 2, No. 15, pp. 405-409. Paris, March 15, 1913.

A short account of the history of the Grignon Agricultural College; the advantages offered to the students by the estate and agricultural industries attached to the College.

455 - **The Canadian Experimental Farms Report for the Year ending March 31st 1912.** - *Department of Agriculture, Ottawa*, 1912.

This is the most comprehensive report so far issued by the Department of Agriculture at Ottawa, as it deals with every phase of Canadian agricultural activity, The first 230 pages are devoted to the reports of officials whose head quarters are at the Central Farm at Ottawa, the remaining 216 pages dealing with experiments and investigations that are being carried on at the ten Branch Farms and Stations distributed over the different provinces.

The Dominion Agriculturist, J. H. Grisdale, deals with the live stock and rotation experiments at the Central Farm, giving some interesting detailed tables of costs of working and production: amongst these may be mentioned that of the dairy herd, where it is shown that yields varying from 3 000 lbs. to 11 000 lbs. of milk per head per lactation period were obtained at a cost varying from 2*s* 6*d* to 5*s* 4*d* per 100 lbs. of milk. The data of the rotation experiments are also most complete, the returns per acre for each crop and for the whole rotation affording interesting comparisons. The net profits per acre vary from 22*s* to 38*s* under the different systems.

The Dominion Cerealist, Dr. C. E. Saunders, announces a new wheat which promises to become of great value in the more northerly sections of Canada as it ripens fully a week earlier than Marquis. This new variety, which has been named « Prelude », is also a good yielder and ranks very high in baking strength.

The Report of the Dominion Chemist, Dr. F. T. Shutt, is dealt with separately (1).

The Horticulturist. the Entomologist, the Botanist, and the Poultry Manager all present reports of the work done during the year in their respective branches.

The reports of the Superintendents of the branch farms and stations are of special value to farms in the varions provinces and districts served, as the work undertaken, in each case, is planned to study the local problems of crop and live stock production.

456 – **A Proposed Tropical University.** — *Agricultural News.* Vol. XII, No. 282, pp. 50-51, and 59, Barbados, February 15, 1913.

This article sets forth the great advantages which a Tropical University on the spot offers to colonists and gives the reasons which make the British West Indies an especially suitable place for the establishment of such a University. In the same number of the *Agricultural News*, the article from the *Times* of January 23, entitled " The Case for a Tropical University " is given *in extenso*.

AGRICULTURAL INSTITUTIONS

457 – **The Work of the Agricultural Association of Tunis.** – L'Association agricole, *Bulletin Mensuel de l'Office du Gouvernement Tunisien*, Year VII, No. 63, pp. 23-24, Paris, February 15, 1913.

The Agricultural Association of Tunis has been divided into two sections, owing to the extent of its field of operations and in order to give sufficient scope to its developing energy. These two sections are entitled, the Central Co-operative Society (Coopérative centrale), which deals with the business transactions connected with trade; and the Tunisian Farmers' Society (Société des Agriculteurs de la Tunisie), which occupies itself with technical agricultural questions. In 1912 the latter studied and dealt with many important matters, such as the organisation of markets of the nature of exhibitions, the founding of insurance companies, and the use of mechanical power for ploughing.

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(1) See below, No, 474. (*Ed.*).

So far, the Association has established 26 Agricultural Credit Banks, of which the turnover in 1912 amounted to £ 95 360. It is proposed, during the current year, to open 10 Agricultural credit Banks for natives, each with 20 to 30 members. Three Breeders' Associations have been established at Beja, Munchar, and Medjez-el-Bab; while others are to be started in the near future. The question of the advantages of forming associations for mechanical ploughing and of the creation of Long-Credit Societies requires further consideration. The Council of the Committee of the «Coopérative centrale» is also occupied with the important work of forming Associations for the purchase of manures and for the sale of cereals.

458 – **The Necessary Changes in the Organisation of the Procedure Relating to the Sub-division and Re-adjustment of Holdings.** – PLAHN: in *Deutsche Landwirtshaftliche Presse*, Year XXX, No. 9, pp 99-100. Berlin, January 29, 1913.

The writer wishes that the procedure relating to the readjustment of holdings should be altered in the following three important particulars:

1) The General Commissions should no longer, as heretofore, exercise legislative and executive powers, but that these functions should be entirely separate.

2) The execution of the designs should not be entrusted to the Special Commissioner (as a rule only a legal specialist), but should devolve by law upon the technical expert who surveys the land.

3) All the owners of property interested in the matter should have the right of a Public Company to negotiate a common loan.

459 – **The Formation of Horticultural Committees in the Prussian Chambers of Agriculture.** — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 9, pp. 63-64. Berlin, March 3, 1913.

A Ministerial Decree of January 28 advises the formation of Horticultural Committees in the Chambers of Agriculture in Prussia, and gives suggestions as to their composition and duties.

GRICULTURAL HOWS AND ONGRESSES

460 – **Agricultural Shows.**

Argentine Republic.

1913. Oct. 12-17. Corrientes. — Agricultural, Live Stock, and Indusrial Show, organised by the «Sociedad Correntina de Hacendados».

Australia: New South Wales.

1913. July 17-18. — The Deniliquin Pastoral and Agricultural Society. L. Harrison, Secretary.

Aug. 19-12. Wagga. — Murrumbidgee Pastoral and Agricultural Association. A. F. D. White, Secretary.

Aug. 26-28 Gunnedah Pastoral, Agricultural and Horticultural Association. M. C. Tweedie, Secretary.

Aug. 27-28. — Parkes Pastoral, Agricultural and Horticultural Association G. W. Seaborn, Secretary.

Sept. 2-3. — Ariah Park Pastoral, Agricultural, Horticultural and Industrial Association J. N. Taylor, Secretary.

Sept. 2-3. — Wellington Pastoral, Agricultural and Horticultural Society. A. E. Rotton, Secretary.

Sept. 3-4. — Germantown Pastoral, Agricultural and Horticultural Society. J. S. Stewart, Secretary.

Sept. 3-4. — Junee Agricultural Association T. C. Humphreys, Secretary.

Sept. 9-11. — Young Pastoral and Agricultural Association. T. H. Tester, Secretary.

Sept. 9-11. — Albury and Border Pastoral, Agricultural and Horticultural Society. W. I. Johnson, Secretary.

Sept. 16-17. — Cootamundra Agricultural, Pastoral, Horticultural and Industrial Association. M. T. Williams, Secretary.

Sept. 16-17. — Cowra Pastoral, Agricultural and Horticultural Association. G. S. Fisher, Secretary.

Sept. 23-24. — Murrumburrah Pastoral, Agricultural and Industrial Association. J. A. Foley, Secretary.

Sept. 30 Oct. — Hay Pastoral and Agricultural Association. Secretary, G. S. Camden.

Belgium.

1913. May 4 - June 1. Liège, Palais des Beaux-Arts. — International Documentary Exhibition of Ornithology, and of Entomology and Botany from an Ornithological Point of View. General Secretary: L. Cuisinier, 155 Rue de Bruxelles, Ans.

May 14-24. Brussels, Palais du Cinquantenaire. — International Horse Show, organised by the Royal Horse Society of Belgium. Rue des Deux Eglises, 33, St. Josse-ten-Noode Bruxelles.

June 14-16. Ghent. — Temporary International Poultry Show at the Ghent Exhibition. For particulars apply to Boulevard de la Senne, 90, Bruxelles; or Chaussée de Bruxelles, 4, Ledeberg (Ghent).

France.

1913. May 5 - Oct. 15. Vichy. — International Exhibition. One section is devoted to agriculture and horticlture; others to machines and motors. For information apply to: Direction de l'Exposition Internationale, 18 Rue Scornin, Vichy.

Paris, «Société Nationale d'Horticulture de France», 84 Rue de Grenelle. Shows arranged by the Society: June 12. — paeonies, irises, orchids; July 10 — roses, vegetables; Aug. 14. — gladioli, plants in bloom; Sept. 11 — dahlias, asters, fruit; Oct. 9 — early Chrysanthemums, orchids, fruit.

June 6-9 Versailles, Park. — Exhibition of Horticultural Products, organised by the Horticultural Society of the Department of Seine-et-Oise. Apply to M. Hueber, General Secretary of the Society, 40, Boulevard du Roi, Versailles.

June 9-15. Chambery (Savoy). — Horticultural Show.

June 9-15 Chambery. — Interdepartmental Agricultural Show. This will include live stock, horticultural products, Savoy wines, agricultural machines, spraying machines, etc.

June 12-15. Evreux. — Poultry Exhibition in the enclosure of the central Exhibition), organized by the Society of Norman Poultry Breeders (Societé des Aviculteurs Normands), 9 Rue Josephine, Evreux (Eure).

June 14-22. Grenoble (Isère). — Horticultural Exhibition.

June 18-12. Paris. — Central Show of Stud Horses and Asses. Prizes will amount to 232 900 frs.; 17 cups, 464 medals. Apply to: «Ministère de l'Agriculture, Direction des Haras 2e Bureau».

June 21-23. La Rochelle, Casino municipal — General Horticultural Show organized by the Horticultural and Viticultural Society of Lower Charente. President: M. Lefebvre, 4, Rue Réaumur, La Rochelle; Secretary, M. Morin, 57 Rue Alcide d'Orbigny, La Rochelle.

June 28 - July 6. Saint-Mandé (Seine). — National Exhibition of Horticulture and Fine Arts organized by the Horticultural Society of Vincennes. For particulars respecting the Horticultural Section, apply to M. E. R. Pacotto, President of the Organisation Committee, 11 Rue de la Marseillaise, Vincennes.

July-October. Brest, Place du Château — Exhibition of West France. Among other there will be a section for Agricultural machines and Implements. Apply to: M. le Président de l'Exposition de l'Ouest de la France, Brest.

July 5-7 La Basée. — Annual Show of the Agricultural Comice of the Arrondissement of Lille. Apply for information to the Secrétariat général du Comice 112 Rue de Paris, Lille.

July 12-14 Senlis (Oise). — General Horticultural Show organised by the Société d'Horticulture de l'arrondissement de Sentis. For particulars apply before June, to M. Lelièvre, Secretary General of the Society, Senlis.

August 15-17. Montereau (Seine-et-Marne). — Fifty-first Show organised by the Société d'Horticulture de Melun et Fontainebleau.. Apply to M. Zanotte, Secretary, Rue de l'Hôtel-de-Ville Montereau.

November. Paris. Twenty-fourth Show of the Société nationale d'Aviculture de France. Cold Storage Installation, Exhibition of the Automobile Club of France. The latter club, wishing to show the advantages accruing to farmers from the use of refrigerators driven by explosion motors, has organised an annual competition, with prizes, for the owners of the best plant. This competition will be held for the first time in 1913, in the South-East region.

1913-1915. Show of Machines for cutting over coppices, organised by the Société des Agriculteurs de France, 8 Rue d'Athènes, Paris. A prize of 3000 frs. will be awarded in 1915 after two competitions in 1913-1914. Date of entry: May 31, 1913.

1914. Jan. 18-19 Lille. — Fifteenth International Exhibition of the Poultry Breeders of the North. Secretary General. M. Emile Desreumaux, 92 Rue Franklin, Roubaix. (Nord).

Germany.

1913. Oct. 7-12. Berlin. Exhibition Halls of the Institute for Fermentation Industries. — Exhibition of Machines and Implements for the Brewing Industry, organised by the « Versuchs und Lehranstalt für Brauerei » of Berlin.

1914. Hamburg. Hamburg-Altona Central Cattle Market. — Show of Fat Stock. Apply to the Geschäftsführenden Ausschuss der Hamburger Mastviehausstellung » at Hamburg.

Holland.

1913. May 9-22. Bellevue (neighbourhood of Amsterdam). General Exhibition of Ornamental Plants and Flowers. Secretary of the Exhibition, M. G. F. Koopman.

Italy.

1913. Aug. 15 - Oct. 15. Parma. — Exhibitions during the Celebration of the Centenary of Giuseppe Verdi. Floricultural Exhibition: Entries until May 31; apply to the « Cattedra Ambulante di Agricultura », Parma. International Exhibition of Dairy Machines and Apparatus: opens Aug. 17. Provincial Exhibition of Butter and Cheeses: opens Sept. 20. Also: Mechanical Ploughing Competition; Exhibition of the Apennine Region; Farm Competition; Exhibition of Chemical Manures; Poultry and Rabbit Show; Pork Butchers' Exhibition; Wheat Show.

June. — November. Bologna, Halls of the Provincial Agricultural Office, 15 Via d'Azeglio. — Permanent Fruit Show organised by the Provincial Agricultural Office of Bologna. In addition in order to encourage fruit-growing, the Office, with the cooperation of the Ministry of Agriculture and various social bodies, is opening a competition among fruit-growers in the province for new plantations.

June-December. Bari. — Exhibition of Labour and Industry, and Agricultural Show. Apply to the « Direzione dell'Esposizione del Lavoro e dell'Industria, Bari ».

Competition among cooperative Dairies organised by the « Società Agraria di Lombardia », Milan, 2 Piazza Fontana; latest date of entry: June 30, 1913.

August. Potenza (Basilicata). — Live Stock Show.

October. — Live Stock Show of the Valsassina organised by the « Comizio agrario » of Lecco. Nov. 1-15 Florence. — Horticultural Exhibition (Chrysanthemums, Fruit, etc.); apply to the President of the Commission, 17 Via Bolognese, Florence.

1914. March-November. Genoa. — Exhibition of Colonial Agriculture.

United Kingdom.

1913. Sept. 20-27. London, Royal Agricultural Hall. — Twentyfirst Annual International Exhibition of the Grocery, Provision, Oil and Italian Warehouse and Allied Traders. Secretary, H. S. Rogers, Palmerston House, Old Broad St., London E. C.

Union of South Africa: Natal.

1913. June 6-7. Vryheid. — Show organized by the Vryheid Agricultural Society.

June 20-21. Greytown. Show organised by the Umvoti Agricultural Society.

Uruguay.

1913. October. Tacuarembò. — Second National Agricultural and Live Stock Show.

International Competition of identification marks for cattle, goats, sheep and pigs, organised by the Government of Uruguay. 27000 frs. are to be given in prizes and a sum not exceeding 270.000 frs. is offered by the Government for the purchase of the best system.

461 – Agricultural Congresses.

Austria: Bosnia-Herzegovina.

1915 Serajevo. — Sixth International Ornithological Congress.

Belgium.

1913. July. Ghent. — International Congress of the Wine Trade, organised by the « Comité International du Commerce des Vins, Cidres, Spiritueux et Liqueurs », 27 Rue du Louvre, Paris.

Aug. 2-4 Ghent. — International Congress for the Prevention of the Adulteration of Food Stuffs.

Oct. 20. Ghent. — Eighteenth Chrysanthemum Congress on the Occasion of the International Exhibition of Chrysanthemums and Fruit.

France.

1913 June 5. Périgueux — First Congress of the National Union of the Horticultural Societies of France.

June 16-20 Paris International Forestry Congress.

1914 Sept. 4-12. Havre. — Congress of the French Association for the Advancement of Science.

Russia.

1914. St. Petersburg. International Agrogeological Congress.

Spain.

1913. Oct. 15-22 Madrid. — International Congress of Hydrology, Chimatology and Geology.

1915. Madrid. — International Congress of Colonial Agronomy.

1915. April. Madrid — Second International Soil Congress.

Switzerland.

1913. July 6-9 Glaris. — Annual Meeting of the Swiss Forestry Association.

Aug. 4-7 Solothurn — Annual Meeting of the Swiss Forestry Association.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

462 – **The Conservation of Snow: its Dependence on Mountains and Forests.** – CHURCH, J. E., Jun (Agricultural Experiment Station, University of Nevada): in *The Official Bulletin of the International Irrigation Congress*, Vol. 1, No. 6, pp. 45-52, Salt Lake City, Utah, December 1912.

Mountain ranges not only receive more snow than plains or valleys, but owing to the lower temperatures prevailing on their slopes, retain it for a longer period; they are, however, by their elevation, exposed to sweeping winds which dissipate and evaporate the snow, so that any means tending to break the force of the wind will also tend to conserve the snow, and render it available as an increased water supply to the plains and valleys during the summer. Crags are better wind breaks than trees and are found at higher elevations, but since the area covered by them is small, it is important not to neglect the less efficient substitutes.

In order to estimate the part played by forests in the conservation of snow on mountain sides, a system of surveys was begun in 1909, and the amount of snow was estimated at various points by means of a steel augur and a spring balance on which the amount of snow in the augur could be read off as inches of water. The regions studied included both the semi-arid and wind-swept eastern side of the Sierra Nevada with the adjacent lowlands, and also the moister and more sheltered basin of Lake Tahoe, where forests of varying types and densities occur.

The following is an example of some of the measurements obtained:

	water content of snow in inches	
	March 1	April 5
Base of Mount Rose (5500 feet):	—	—
Reafforested area thickly covered with young pines 30 feet high	5.5	—
Deforested area dotted with clumps of bushes	2.4	—
Typical sagebrush area	0.6	
Summit of Mount Rose (10 800 feet):		
Unforested lee slope protected from the wind	35.1	37.9
Forested slope at the timber line	41.1	45.4

The figures show the value of trees in gathering and conserving the snow. At an altitude of 5 500 feet the timbered area had nine times as much snow as the sagebrush area, while higher up the mountain side the forested slope had one-fifth more than the unforested lee slope above it, and the difference increased during the interval between the two sets of measurements.

The type of forest also has a marked effect on the accumulation and conservation of snow:

1	A forest of pine and fir	with a maximum storage of	12.1 in.	retained	0.6 in.	on April 20
	A fir forest	» » »	11.0	»	2.7	»
2	A very dense fir forest	» » »	10.9	»	0.9	April 25
	» » » with glades	» »	16.5	»	3.2	»

The more open forest of pine and fir gathered more snow but retained less than the pure fir forest, but evidently the density of foliage is not the only factor in the conservation of snow for in the second series of measurements the presence of glades in the forest increased the storage power to a considerable extent. The ideal forest would therefore seem to be a dense one with a maximum number of glades, whose area bears such proportions to the height of the trees that neither the wind nor the sun can reach to the bottom. As to the kind of tree to be used for elevations below 8 000 feet, fir has given the best results, while above that height mountain hemlock was most efficient.

A study has also been made of the increase in depth and density of the snow with elevation, and seasonal forecasts of the moisture stored in the mountains have been inaugurated which are of great value to the irrigator and to the user of water power.

403 – **Meteorology in Canada.** – STUPART, R. F. (Director of the Dominion Meteorological Service) *Reprint from the Journal of the Astronomical Society of Canada.* March-April, pp. 75-87. Toronto, 1912.

After a historical sketch of the origin and growth of the Meteorological Service in Canada, the writer gives an account of the present scope of its work.

The headquarters of the Service are at Toronto, the present observatory and offices dating from 1909; there are also 543 other stations in the Dominion at which observations are taken; and 41 of these send bi-daily telegraphic reports to Toronto. The synoptic weather map has been adopted as a basis of weather forecasts and every effort has been made to broaden the field from which observations are obtained, but as the telegraph does not yet reach much beyond the southern margin of Canada the weather map exhibits a vast blank to the northward, and cloud observations showing motion of the upper air are fragmentary and unreliable. Recently, through the co-operation of the United States Weather Bureau, a most promising development of the daily weather map has been made possible by obtaining a certain number of foreign reports as follows: Ireland, Faeroe Islands, London, Stornaway, Malin Head, Blacksod Bay, Shetland Islands, Cuxhaven, Vladivostock, Shanghai, Lisbon, Azores, Turks Island, Havana, Honolulu and Manila, together With several United States stations in Alaska, also 12 stations in Russia and Siberia and one in Japan. These reports are received in Toronto at about 10 a.m. and together with the reports of the American continent are entered on a map of polar projection and show with fair certainty the distribution of pressure over the northern hemisphere. Within the last few years too, stations have been opened at 10 points in the northland forming a chain from Northern Alberta to the Arctic Sea, and though at present their reports are transmitted by mail and therefore only serve to extend the isobars of the past month into high latitudes, it is hoped that in the not distant future wireless stations will be placed in the far North, as reports from such stations would afford most valuable data for the preparation of weather forecasts.

During 1911 balloons carrying the Dines Meteorograph were sent off with regularity, and of 21 sent up, 12 returned to the central office with good records. The heights reached varied from 11.2 to 23.2 kilometres. The isothermal layer was found at an average height of 12.6 km. ranging from 16 km. on November 8 to 9.5 km.on December 7. The lowest temperature recorded was—70°C at 15 km.on September 9. A kite station has been established at Agincourt, and observations of pressure, temperature, humidity and wind direction in the free air have since been obtained with fair regularity. The highest ascent yet reached is 2.408 m. (7900 feet) above sea level.

Newfoundland receives forecasts and storm warnings from the Canadian Service, but maintains her own Meteorological stations and publishes her own weather bulletins. It is expected that before long both the Canadian and the Newfoundland reports will be cabled to England, where they will be of decided use to the British Meteorological Office.

There are at present 110 storm signal stations, 72 on tidal water aud 32 on the Great Lakes. The percentage of verification of forecasts for 1911 was 861 and of storm warnings 917. Mariners and fishermen pay close attention to storm warnings, while shippers of perishable goods consult the forecasts before shipping; moreover pilots of unseaworthy craft, such as dredges and barges, at all times of the year, and of all vessels during the late autumn, allow themselves to be guided from port to port by the meteorological official.

SOIL PHYSICS,
CHEMISTRY
AND
MICROBIOLOGY

464 - **Application of the Ammonium Carbonate Method for the Determination of Humus to Hawaiian Soils.** — RATHER, J B. Texas Agricultural Experiment Station, College Station, Texas. — *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 3, pp. 222-223. Easton, Pa., March 1913.

The ammonium carbonate method for the removal of clay from humus has given uniformly good results on a number of the soil types of the United States, but on exceptional soils, like some of those of Hawaii, a slight modification of the method is necessary to remove the clay. The modification consists essentially in increasing the amount of ammonium carbonate to 2 gr. per 100 cc., and heating for one hour.

465 - **The Intensity of Nitrification in Arid Soils.** - STEWART, R. Contribution from the Chemical Laboratoy, Utah Experiment Station, Logan, Utah, U. S. A. *Centralblatt für Bakteriologie, etc. II. Abt.* Vol. 36, Nos. 19-25, pp. 477-490. Jena, February 15, 1913.

The writer discusses the common conception that nitrification takes place with great intensity in arid soils. The discussion of former data, particularly of Hilgard, of Headden and of the writer himself (1), leads to the following conclusions.

The conception that nitrification takes place with great intensity in arid climates rests primarily upon the observed fact that nitrates tend to accumulate in great quantities in certain arid soils. These nitrate accumulations always accur in connection with other water-soluble salts, such as sodium chloride and gypsum. No nitrate accumulations have been observed in arid soils free from other water-soluble salts. The alkali salts must therefore be intimately associated with the nitrates in one of two ways: 1st, they must exert a markedly favourable influence upon nitrification; or 2nd, the nitrates, like the other alkali salts, are of remote origin. From the data presented, it seems that the latter conception is the correct explanation.

The nature of the material out of which many of the soils of Utah and Colorado are formed seems to indicate that the nitrate accumulations found in these soils are undoubtedly of marine origin. The alkali occuring in many soils of Utah has been, in a large measure, deposited at the time of the formation of the shale; and, on the decomposition of this shale in the formation of the soil, the alkali has been incorporated with the latter. The passage of the water through the shale structure also washed out the soluble salts and carried them to the lower-lying land.

The presence of the nitrates in the alkali soils of the arid belts, in addition to the possibility of injury arising therefrom, is of significance from other points of view. It is a well known fact that alkali soils a year or so before «going bad» produce a luxuriant growth of plants, which may be accounted for by the movement of the nitrates up to the feeding range of the plants, while a year or so later the salts become so concentrated as to cause the death of the plants.

Arid soils are markedly poor in organic nitrogen, and yet the crops produced are excellent. The soils are not «nitrogen hungry». Hilgard has attempted to account for this apparent anomaly by the assumption that since the small amount of humus in arid soils is relatively richer in nitrogen than the humus in humid soils, this fully compensates for the apparent deficiency in nitrogen. An appreciation of the tendency of the nitrates, formed during the past ages, to accumulate in arid regions is suggested as a better explanation of this fact, and as being not open to the mathematical objection that has been raised against Hilgard's assumption. The writer maintains that there is no reason to assume that the accumulation of nitrates in arid soil indicates a rapid bacterial action at the present time; but that these accumulations indicate a concentration of the nitrates already in the soil formed by slow bacterial action in the remote past. The application of the irrigation water has simply furnished a medium by which the nitrates may move, or be moved, from one place to another. This source of nitrogen affords a clear explanation of the fact that in some cases the surface foot of cultivated arid dry-farm soils is richer in organic nitrogen than is that of the adjacent soils. The nitric nitrogen is obtained by the deep-rooted plants from the subsoil, converted into organic nitrogen by the plant, and then added to the surface soil by plowing under of the straw. The writer, however, fully realises that there is the possibility of ammonification, nitrification, and even nitrogen fixation taking place, to a certain extent, in some alkali soils at the present time; but from the data presented he assumes that the great accumulations of nitrates found in many alkali soils are of remote origin, being concentrated in their present position by the movement of the soil moisture.

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(1) See No. 775, *B.* April 1912; No. 897, *B.* June 1912. (*Ed.*).

Realizing fully that the term «alkali» must be so extended as to include not only the carbonates, chlorides and sulphates, but also the nitrates of the alkali metals, and recognizing clearly the source and method of nitrate accumulations in American arid soils, the writer believes one is in a position to work intelligently toward a solution of the problems presented by these unusual accumulations; and that the adoption of the methods of controlling the accumulations of alkali at the surface as suggested by Hilgard over twenty years ago, such as mulching, tillage and proper drainage, will convert the nitrate scourge into a blessing in disguise.

466 – **Movement of Nitrates in the Soil** (1). — ROUSSELLE, V.: in *Annales de la Science Agronomique*, Year 30, No. 2, pp. 97-120. Paris, February 1913.

A confirmation of Schlœsing's results that no appreciable diffusion of nitrate takes place in the soil, but that layers of nitrate are merely displaced either downwards by percolation or upwards by the capillary current.

467 – **The Effect of Toluol and Carbon Disulphide upon the Micro-Flora and Fauna of the Soil.** — GAINEY, P. L. From the *Twenty-Third Annual Report of the Missouri Botanical Garden*. Dec. 16, 1912.

The work presented was undertaken to determine whether the theory advanced by Russell and Hutchinson (2) was adequate to explain the phenomena subsequent to partial sterilisation when applied to local soils.

The writer gleans from the literature the following evidences regarding such treatment.

(*a*) A temporary decrease in total number of bacteria present, with a subsequent large increase: Krüger and Heinze, Massen and Behn, Pfeiffer, Hiltner and Störmer, Russell and Hutchinson, Hutchinson and Fred.

(*b*) An increase in oxidation: Fischer, Hesselink van Suchtelen, and Darbishire and Russell.

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(1) See No. 109, *B.* Feb. 1913. (*Ed.*).

(2) See No. 14, *B.* Jan. 1913; also RUSSELL, E. J.: Recent Investigations at Rothamsted. — *B.* March 1913 pp. 336-341. (*Ed.*).

(*c*) An increase in ammonification: Störmer, Scherp, Laidlow and Price, Lipman, and Russell and Hutchinson.

(*d*) A detrimental effect upon nitrification: Warington, Scherp, Laidlow and Price, Perrand, Pfeiffer, Wagner, and Russell and Hutchinson.

(*e*) A beneficial effect upon nitrification: Brailles, Wollny, Pagnoul, Störmer, Coleman, Lipman, Koch, and Fred.

(*f*) A detrimental effect upon nitrogen fixation: Störmer, Koch, Massen and Behn, and Koch and associates.

(*g*) A beneficial effect upon notragen fixation: Kranskii, Heinze, Lipman, and Fred.

(*h*) A detrimental effect upon denitrification: Wagner, Hiltner and Störmer, Störmer, Lipman and Fred.

(*i*) In regard to the effect upon nodule organisms: Wollny and Nobbe and Richter believed such effect beneficial, while Perotti, Koch and Fruwirth held the opposite view.

In addition to the above, Hiltner and Störmer, and Russell and Hutchinson have studied with some care the flora, as a whole, prior and subsequent to treatment; and they found that certain types were detrimentally and others indirectly beneficially affected. Russell and Hutchinson have also studied, more or less, the effect of such treatment upon the micro-fauna and, as a result, claim that all types of animal life, with perhaps one exception, are totally destroyed. Fred studied certain types of soil organisms in liquid cultures and found that the addition of certain strengths of various antiseptics stimulated development. The strength varied with different organisms and the stimulative effect diminished gradually from the maximum in both directions.

From the evidence brought forth in the experimental work the writer draws as justifiable the following conclusions:

I. That small quantities of carbon disulphide, toluol, and chloroform, such as have been used practically and experimentally (0.01-20 %, optimum 0.2 %, when applied to the soils studied, exert a stimulative rather than a diminishing effect upon the total number of bacteria present.

II. That an application of such quantities of carbon disulphide and toluol does not have an appreciable effect upon the number of types of protozoa present in such soils as have been studied.

III. That a very marked increase in yield may be noted following such an application when no evident change occurs in total number of bacteria present.

IV. That, in the light of the recent work of Koch, Egorov, Goodsey, Fred, and others, with results presented in this paper, the theory advanced by Russell and Hutchinson to account for the increased yield following the application of such chemicals, appears not tenable for general application.

A list of 40 references is appended.

468 - ***Denitrobacterium thermophilum*** **sp. nov.: a Contribution to the Life-History of Thermophile Bacteria.** — AMBROŽ, A. and CHARVÁT, J. Aus dem bakteriologischen Institut der K. K. böhm. technischen Hochschule in Prag. — *Centralblatt für Bakteriologie, etc.*, II. *Abteilung*, Vol. 37, Nos. 1-3, pp. 1-10 + 2 figs. and 1 plate. Jena, March 8, 1913.

A description is given of a new denitrifying bacterium, *Denitrobacterium thermophilum*, which has been isolated from the soil, and of experiments concerning the nature of thermophilous denitrification, which process seems not to be confined to nitrates.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

469 - **Small Hill Reservoirs for Irrigation.** — BRUTTINI, A. Laghetti artificiali o serbatoi costruiti in collina e collegati fra loro a gradinata, per l'irrigazione in pianura. — *L'Italia Agricola*, Year 4, No. 7, pp. 169-171 + 2 figs. Piacenza, 1913.

This paper deals with a series ot reservoirs (at present three) constructed by Prince di Lucedio, Carrega, on his estate Casino de' Boschi, near Sala Buganza, Parma, Italy.

The principle on which these constructions are designed may be adopted in all countries where arable lands in the plains are near hills or mountains.

Every hill or mountain is furrowed by small valleys in which spring or rain water flows, and as such valleys in some places widen and in others narrow, the plan was adopted of erecting successive barrages in the narrowest points of the valley, thus forming as many small artificial lakes, the arrangement of which, save for their greater dimensions, recalls the warping by steps as it is practised in Tuscany and in other countries for filling up ravines.

The base of every barrage is traversed by a a cast-iron pipe provided with a vertical sliding gate. Provision is also made for surface overflow. The valley acts as a canal between the successive reservoirs, the lowest of which supplies the water for irrigation, and is replenished by the upper ones. Thus the separate reservoirs are together equivalent to one large one, but have the advantage of costing much less to build and to keep up.

As for the technical and economical details of the work done, it may be stated that the first reservoir built contains 494 000, the second 1 589 000 and the third 742 000 cubic feet of water. The latter will be fed by other higher reservoirs, one of which is already being built and will contain 3 108 000 cub. ft. The cost price per 100 cubic feet of capacity in the various reservoirs is the following: 1s *7d* for the first reservoir, 11 $^3/_4$ *d* for the second, 1s 1*d* for the thid and 1s for the fourth.

The dams are made of rammed earth laid in layers about 12 inches high, and watered, whilst being rammed, with lime water so as get a better cohesion between the particles of earth and greater impermeability to water. The base of the inner slope of the dam is twice the height of the latter, the base of the outer one being 1.5 times the height. The breadth at the top corresponds to the formula $3+\frac{5}{17}(h-3)$. The dam is sunk into the ground to a depth of 6 feet.

Sig. Ponzi, the engineer of work, states that these reservoirs have nothing to fear from silt, because the water that reaches them is clear, coming as it does from catchment basins (about three-quarters of a square mile) covered with woods and pastures. Should it, however, be necessary to scour the bottom of the reservoirs, it can be done by allowing the water to issue under a head of 6 feet and if necessary the mud could be previously stirred up.

The amount of water available in the reservoirs from the middle of May to the end of June is 5 933 000 cub. feet. This quantity distributed in four times in July and August amounts for each irrigation, lasting 196 hours, to 1 483 250 cub. feet, to which 0.42 cub. feet per second of running water must be added, bringing the total available for each irrigation to 1 995 410 cub. ft.

The following data refer to the construction and cost of the reservoirs:

Name of Reservoir	Dam				Reservoir			Cost
		Dimensions at top						
	Height	Breadth	Length	Volume	Length	Area	Capacity	
	ft. in.	ft. in.	ft. in.	cub. ft.	ft.	sq. ft.	cub. ft.	£ s.
Laghi di Rio Grotta 1 lower (1904-05)	16 4	11 6	210 0	109 400	689	—	494 000	396 10
2 upper (1907-10)	28 6	16 5	203 5	240 150	853	107 640	1 589 000	793 0
3. Lago del Rio Montempo (1911-12)	26 3	13 1	147 7	137 700	722	49 514	742 000	396 10
4. Lago del Rio delle Navette (1912-13) . . .	49 2	19 8	282 2	741 600	1 181	139 932	3 108 000	1 586 0
						Totals . . .	5 933 000	3 172 0

The price at which the water is sold is valued for all the reservoirs at *£2 7s 7d* per hour, owing to the considerable increase that has taken place in the growing of irrigated forage crops and of tomatoes. This price could even be raised if the water were to be used at times out of the regular succession and for industrial purposes.

	£	s	d
Considering the net returns at	436	2	8
and deducting for interest on capital employed .	158	11	11
there remains net £	277	10	9

which allows of all the expense being amortized in only 10 years.

470 - **Irrigation Experiments in Brandenburg, Germany.** — AUGSTIN. Ein Ackerbauwässerungsversuch. — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 14, pp. 112-113. Berlin, February 15, 1913.

A detailed description of the experimental installation of irrigation works in 1911, by the Chamber of Agriculture of the Province of Brandenburg in the exploitation of Jüterbog, the Property of Hr. Bohnstedt-Kaltenhauser. The cost and the profit of the installation are given, as well as the excellent results which have been obtained.

TILLAGE AND METHODS OF CULTIVATION

471 - **Field Records relating to Subsoil Water.** - MC GEE, W. G.: *U. S. Department of Agriculture, Bureau of Soils, Bulletin* 98, pp. 40. Washington, February 1913.

In the semi-arid regions of the United States which have been made productive by the adoption of the dry-farming system, large yields of crops are obtained with an apparently totally insufficient moisture supply in the shape of an annual rainfall of 15 inches; and the present bulletin sets forth the result of an enquiry into how far this insufficient rainfall is supplemented by an underground water supply.

In South Dakota the soils are derived from the underlying clays and shales, and where the latter are exposed in wells, railway cuttings, etc., they are moist almost to the point of saturation, and the moisture increases uniformly with the distance from the surface, suggesting a subterranean rather than a superficial source of supply. The whole district may be looked upon as an artesian area with a catchment area on the Eastern Slopes of the Rocky Mountains, whence the Dakota sandstone conveys the water to South Dakota, the water gradually leaking into and through the overlying clays and shales. The rate of percolation and seepage cannot be accurately stated pending systematic observation, but it has been provisionally estimated at over 12 inches per annum — sufficient to supplement the 15 inches of rainfall and produce an abundant crop.

Another portion of the Region of the Great Plains was studied in South-Western Kansas, and a detailed description of the ground-water condition is given. The conclusion is drawn that the district is underlain by a reservoir of moisture flowing eastward, and derived both from the local rainfall and from catchment on the mountains or higher parts of the plains. The water table occasionally comes to the surface and gives rise to perennial streams and permanent ponds, but though within reach of the surface by capillary movement, it usually lies at an average depth of 30 feet, and may be considerably lowered by excessive use. A provisional estimate was made that 6 to 8 inches of water per annum would rise from the underground supply and be available for plant growth.

It would be difficult to overestimate the importance of these results, for the areas where the subterranean movement and supply of water are indicated coincide with those where dry-farming has been most successful, and it may be inferred that there is a close connection between the two phenomena. Moreover, if this be the case, it will also explain why the system yields such far less satisfactory results when applied to other parts of the world where different geological conditions obtain.

472 – **Experiments in Subsoiling at San Antonio.** — HASTINGS, S. H. and LETTEER, C. R.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* 114, pp. 9-14. Washington, February 1913.

Experiments were carried on for three years in a semi-arid region of Texas to estimate the value of subsoiling to the crops. In no instance was the difference in yield significant, nor was the moisture content of the soils increased.

473 – **Dry Farming.** – HENDERSON G. S.: in *The Agricultural Journal of India*, Vol. VIII, Part 1, pp. 41-46. Pusa, January 1913.

A general survey of the dry-farming conditions in the semi-arid districts of the United States, with a discussion of how far the system might be applied to similar regions in India.

MANURES AND MANURING.

474 – **Nitrogen-Enrichment of Soils: Clover as a Manurial Agent.** – SHUTT, F. T. Report of the Dominion Chemist. – *Appendix to the Report of the Minister of Agriculture, Experimental Farms, Reports for the Year ending March* 31, 1912, pp. 139-171 (144-146) + fig. 1. Ottawa, 1912 (1913).

This article describes an experiment instituted to determine by direct analysis of the soil the amount of nitrogen that might become part of it through continuous growth of clover, the soil at the outset being a poor one.

The plot set apart for this work was, in the early spring of 1902, dug out to a depth of 8 in, and the excavation filled in with a well-mixed, light, sandy loam; the subsoil was sand. At the outset the plot was dressed with superphosphate at the rate of 400 lbs. and muriate of potash at the rate of 200 lbs. per acre; no nitrogen was given, but the soil was watered with a solution of "nitragin"; lime at the rate of 1 ton per acre was worked into the soil in the spring of 1909, as the plot was showing signs of sourness.

The first seeding of red clover was made in the early spring of 1902 and a very fair catch obtained; the plot has been in clover continuonsly since that date; the crop was cut as occasion seemed to reqrire throughout the season, the plants not being allowed to go to seed, and the material was allowed to decay on the soil; every second year, the plot was dug over and resown. From time to time, the soil has been sampled and its nitrogen-content determined; the results are tabulated as follows:

Nitrogen-Enrichment of Soil due to the Growth of Clover.

	Date of Collection	Nitrogen	
		Percentage in Water-free Soil	Lbs. per acre to a depth of 4 in.
Before experiment	13-V-02	0.0437	533
After 2 years	14-V-04	0.0580	708
» 4 »	15-V-06	0.0608	742
» 5 »	30-V-07	0.0689	841
» 6 »	23-V-08	0.0744	908
» 7 »	4-V-09	0.0750	915
» 9 »	5-V-11	0.0824	1005
» 10 »	22-V-12	0.0856	1044
Increase in nitrogen due to 10 years'growth		0.0419	511

During the 10 years of the investigation, the soil gained, simply from the growth of clover, on an average 50 lbs. of nitrogen per annum, or had doubled its nitrogen-content. The value of these data, obtained under conditions considered too unfavourable or disadvantageous for profitable farming, is obvious. The inevitable losses in humus and nitrogen, consequent upon the necessary cultivation of the soil when growing crops other than those which put the land in sod, are also discussed, with a view of emphasizing the necessity for the adoption of a rotation which includes the periodic growth of clovers and grasses.

475 – **The Effect of Sulphate of Ammonia on Phosphatic Manures used for Oats.** — MITSCHERLICH, E. and SIMMERMACHER, W. Mitteilungen aus dem landw. Institute der Universität Königsberg, Abteilung für Pflanzenbau. — *Die Landwirtschaftlichen Versuchsstationen*, Vols. LXXIX and LXXX, pp. 71-96 + fig. 4. Berlin, 1913.

This article describes experiments on the solubility of bicalcic and tricalcic phosphates on the addition of other salts, and especially of ammonium sulphate (I), and pot-culture experiments with oats (II).

I. — 2 gr. each of bicalcic and of tricalcic phosphate were shaken up for 10½ hours, at a temperature of 30° C., with one litre of distilled water through which a current of carbon dioxide was kept running. The operation was carried out in Mitscherlich's apparatus (Rührapparat). To a certain number of bottles were added at a given time equivalent amounts of various salts, as shown in the following table, which gives the results of the experiments:

Substance employed	Phosphorus pentoxide dissolved	Increase (+) or decrease (—) produced by the addition of the various salts	Relative increase or decrease as compared with the controls
	%	%	%
2 gr. bicalcic phosphate	18.00	—	—
» » » + 10 gr. ammonium sulphate .	29.51	+ 11.51	+ 64
» » » + 8.1 » » chloride .	26.51	+ 8.51	+ 47
» » » + 10.76 » sodium sulphate. . .	30.68	+ 12.68	+ 70
» » » + 13.02 » calcium » (gypsum)	13.67	— 4.33	— 24
» » » + 26.16 » magnesium sulphate (hydrated).	28.12	+ 10.42	+ 58
2 gr. tricalcic phosphate	7.16	—	—
» » » + 13.2 » calcium sulphate (gypsum)	5.30	— 1.86	— 26
» » » + 10 » ammonium sulphate .	14.44	+ 7.28	+ 102

The amount of phosphorus pentoxide dissolved was only diminished by the action of calcium sulphate ; all the other salts increased it, especially ammonium sulphate. It is very probable that this property of increasing the solubility would also be shown, though to a less extent, in manuring experiments, since it has already been found that the application of ammonium salts greatly promotes the assimilation of slightly soluble phosphates. It may therefore be concluded that the use of these salts would increase the yield, when the factor phosphorus pentoxide is present in a relatively minimum proportion.

II. — In the pot-culture experiments, when the other nutritive principles were present in a soluble condition and in sufficient quantities, the addition of about 16 gr. of soluble salts per 6100 gr. of sand per pot, increased the solubility of the phosphorus pentoxide present in the minimum quantity ; the minimum of calcium compensated for by the addition of gypsum was 3 gr. in the case of bicalcic phosphate and 1 gr. in that of tricalcic phosphate. The addition of only 0.5 gr. of ammonium sulphate brought about a further increase of the crop and a larger assimilation of phosphorus pentoxide. At the same time, the addition of an excess of ammonium sulphate as compared with the amount used in practical agriculture caused injury to the vegetation.

On the other hand, the addition of sulphate of ammonia after a treatment with superphosphate and basic slag produced no increase in the utilization of phosphoric acid by the oats; and in a loam soil, susceptible to phosphatic treatment, it did not increase the solubility of the phosphoric acid present, nor indeed hinder the degradation of the soluble phosphoric acid given as a manure.

The writers propose, in future experiments, to eliminate the action of nitrogen, as well as the acid chemico-physiological reaction of the salts in question, thereby isolating the solubility phenomena and their effects.

476 — The Soluble Silicic Acid in Basic Slag and Its Influence upon the Determination of Citric-Soluble Phosphoric Acid. — POPP, M. (Ref.), CONTZEN, J., HOFER, H. and MENTZ, H.: in *Mitteilung der landwirtschaftlichen Versuchs-Stationen*, Vols. LXXIX and LXXX, pp. 229-278. Berlin, 1913.

The writers attribute the difficulties in the analysis of basic slag to a want of an accurate knowledge of its chemical composition. They confirm the belief that the precipitation of the so-called "injurious" silicic acid should be attributed to a deficiency in soluble iron. If, on the contrary, there is a large amount of the latter present, the colloidal silicic acid remains in solution in the alkaline liquid. The precipitation of ferrous sulphide, due to the addition of ferric citrate, can be prevented by a weak oxidizing agent.

The writers therefore propose the following method : to 50 cc. of citric extract should be added 25 cc. of ferric citrate solution, 10 cc. oxygenated water at 0. 3%, and 25 cc. of magnesia mixture.

The article contains detailed directions, comparisons with other methods, and in conclusion, deals with the analysis of Wolter phosphate.

477. – **The Value to Plants of Potash Derived from Felspars.** — BLANCK, E. Arbeit aus dem agrikultur-chemischen Institut der Universität Breslau. *Journal für Landwirtschaft*, Vol. XLI, Part I, pp. 1-10. Berlin, 1913.

Analyses and culture experiments. The writer gives further evidence that mica is a better source of potash than felspars; and concludes that the facility with which the latter decompose, thus supplying potash to plants, is in direct proportion to their potash and soda content.

478 – **The Fertilizing Action of Sulphur** (1). — DEMOLON, M. A.: in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 156, No. 9, pp. 725-728. Paris, March 3, 1913.

More experiments showing that sulphur is converted into calcium sulphate in the soil, and that the phenomenon is of a biological nature. Further that its fertilizing action is due partly to its effect on the soil bacteria, and partly to the chemical properties of the sulphuric acid which is formed gradually and which not only supplies sulphur to plants but also helps to dissolve mineral elements in the soil.

479 – **The Relative Manurial Value of Nile Water and Sewage.** — LUCAS, A.: in *The Cairo Scientific Journal*, Vol. VII, No. 76, pp. 1-9. Giza, Egypt, January 1913.

Sewage in Egypt may be looked upon as Nile water enriched with special plant foods that are deficient in the soil, and therefore in a rainless climate its application to the soil forms an ideal method of disposal.

480 – **Manuring Experiments in German East Africa.** — Bericht über die in Deutsch- Ostafrika aus Mitteln des Kali- Propagandafonds im Jahre 1911-12 ausgeführten Düngungsversuche. — *Düngungsversuche in den Deutschen Kolonien* (published by the German Imperial Colonial Office), pp. IV + 71. Berlin, 1913.

A resolution adopted on April 3, 1911, by the German Imperial Parliament provided that a part of the funds voted for the furtherance of the consumption of potash salts should be devoted to manuring experiments in the German colonies. This preliminary report contains the first data collected by the Government agricultural consulting expert of German East Africa.

The question of the use of manures in German East Africa is new, owing to the supposed abundance of nutritive substances in the soil, and to the continuous character of the principal cultivated plants (rubber, palms, coffee, sisal, etc.), considered analogous to that of European forest trees.

It is as erroneous to consider the soils of German East Africa very rich as it is to consider them the reverse. In reality there are both kinds, with a prevalence of medium soils, on which it is not possible to continue for a length of time growing impoverishing crops. Consequently the problem of returning plant food to the soil must be faced.

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(1) See No. 234, *B.* March. 1913. *Ed.*).

The following three analyses are characteristic:

	Humus — per cent.	Lime — per cent.	Nitrogen — per cent.	Potash — per cent.	Phosphorus pentoxide — per cent.
Alluvial soil.	0.57	8.12	0.10	1.45	0.11
Light gray soil	0.06	0.01	0.04	0.20	0.03
Red soil.	0.10	0.20	0.06	0.30	0.05

It is also to be remembered that the heat and moisture of the tropics favour an active decomposition of the nutritive substances, and that, especially in light soils, these get washed out by the violent tropical rains. Besides, growing annual and perennial plants together leads to an intense impoverishment of the whole soil. Thus, farming based on manuring becomes a necessity, save for the most favoured localities, and as the general use of farmyard manure is impossible, artificials must be resorted to, with the exception of cases in which green manures are used. As for the plan to be followed, an analysis of the soil is no sufficient guide, but experiments in the various estates must be made, considering also the greater cost of manuring under the proposed conditions. It is considered that in order to secure fairly reliable data the experiments must be repeated for five years in an absolutely uniform manner.

In the experiments which were started in 1911-12 on private plantations, and which included: 14 for rubber, 7 for coffee, 1 for cacao, 14 for coconuts, 1 for sisal, 16 for cotton, 10 for maize, 4 for cereals, 6 for potatoes, 3 for lucerne, 7 for pastures, 4 for vegetables and 2 for beans, and at the Government Experiment Stations 3 for cotton and 3 for maize in rotation, the scheme of at least five series of plots, the so-called differential manuring, based on Liebig's law of minima, was followed:

1. Not manured.
2. Phosphoric acid + nitrogen.
3. Phosphoric acid + potash.
4. Nitrogen + potash.
5. Phosphoric acid + potash + nitrogen.

These fertilising elements were applied under the form of chloride of potash containing 56.8 per cent of potash, of double superphosphate containing 40 per cent. of phosphorus pentoxide, and of sulphate of ammonia containing 25 per cent. of ammonia.

A double set of plots in six series may be arranged as follows:

1	3	5	7	9	11	2	4	6	8	10	12

I. *On one line.*

1	3	5	7	9	11
8	10	12	2	4	6

II. *On two lines.*

Lastly the following doses are recommended:

Crop	Area of plot	Chloride of potash	Double super-phosphate	Sulphate of ammonia
	acre	lbs.	lbs.	lbs.
Cotton	1/4	33	66	88
Maize and tobacco	1/8	22	22	44
Cereals and rice	1/8	16 ½	33	33
Potatoes and beets	1/8	16 ½	22	44
Beans	1/8	16 ½	28 ½	23
Vegetables	1/40	3 ¼	4 ½	8 3/4
Coffee (1 to 3 years)	1/8	11	22	22
» (3 years)	1/8	17 ½	33	33
Manihot Glaziovii (under 2 years)	1/8	11	22	22
» (2 years old)	1/8	16 ½	33	33
Kapok (under 3 years)	3/8	22	44	44
» (3 years old)	3/8	33	66	66
Coconut and oil palm (under 5 years)	1/4	15 ½	31	31
» (5 years old)	1/4	12	44	44
Cacao	30 plants	3 ½ oz	5 ½ oz	11 oz
Sisal	1/4 acre	33 lbs.	44 lbs.	44 lbs.
Fruit trees and vines	5 plants	3 ½ oz	3 ¼ oz	6 ½ oz
Pasture	1/4 acre	22 lbs.	22 lbs.	66 lbs.
Clover, lucerne	1/8 »	15 ½ »	31 »	55 »

The paper reports the results obtained the first year, from which no conclusions can as yet be drawn; the programme of the experiments to be carried out in 1913 is given. The appendix contains further practical instructions for carrying out the experiments and the forms for the tables of results.

481 - **Soil Improvement near Rome.** DE ANGELIS D'OSSAT, G.: in *Atti della Reale Accademia dei Lincei*, Year CCCX, Vol. XXII, Part 4, pp. 246-252. Rome, February 16, 1913.

This is a report upon laboratory experiments conducted with a view to finding the best admixture for «pozzolanella» soils (namely the upper layers of pozzolana), which are frequent in the Roman Campagna. The velocity with which water ascends in these soils, their capacity for water and their rate of drying were determined. The same determinations were made for earthy tufa (often lying under pozzolanella), for marl from the Vatican hill, for mixtures of pozzolanella and tufa, pozzolanella and marl ($^1/_4$ by volume) and pozzolanella, tufa and marl. It was found that marl is much more effective than earthy tufa in rendering pozzolanella less permeable to air, cooler and capable of retaining moisture longer. But only field experiments will prove if the admixture of marl applied to pozzolanella soils intended for meadows will be economically advantageous, and if so, to what extent.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

482 - **Causes affecting the Loss and the Retention of Water Vapour by Plants.** - LECLERC DU SABLON: - in *Revue Générale de Botanique*, Vol. 25, Nos. 290 and 291, pp. 49-83 and 104-122. Paris, February 15 and March 15, 1913.

While authorities have differed greatly as to the degree of importance to be attributed to various factors influencing transpiration, such as light and temperature, the phenomenon has been considered in most cases to be intimately connected with the presence of chlorophyll, and the variations observed in the rate of loss of water vapour under different conditions have been ascribed to purely physical causes. But physical causes are insufficient to explain the results obtained, and some internal physiological causes must be considered as well. Of these the chemical composition of the cell-sap may play some part; but the variations are so small that they could produce but little effect on traspiration, and the author was led to examine with special care the permeability of the cell membranes.

Starting with some preliminary experiments on the transparent leaves of *Elodea*, filaments of *Spirogyra*, and thick sections of ivy leaves, he observed the permeability of the protoplasmic membranes of the cells by means of the penetration of weak solutions of eosine. He found that this varied with the temperature and with the light intensity. This would account for the usual acceleration of the transpiration process in plants exposed to direct sunlight or to high temperatures; but any cause which would tend to contract the protoplasmic membrane, independently of the external conditions, would also render it less permeable and reduce transpiration. This fact was verified 1) by exposing some detached ivy leaves to the rays of the sun for 10 minutes, and 2) by causing them to absorb solutions of high osmotic power and then placing the ends of their stalks in water and comparing them with other leaves whose stalks had been dipping in water all the time. In both cases the subsequent rate of evaporation of the treated leaves was considerably less than that of the untreated leaves, though all the external conditions for the two sets of leaves remained the same.

Anæsthetics, such as ether and chloroform, also had a preliminary retarding effect on transpiration both in light and in darkness; this was followed by a gradually increasing loss of water vapour, corresponding to the setting up of pathological conditions in the cells by the anæsthetic; as the cells died the membranes lost all power of withholding the water.

The relation between transpiration and the presence of chlorophyll was studied by comparing the green and the colourless leaves of variegated plants under different conditions of light and heat. Leaves placed in sunshine, in diffused daylight, or in higher temperatures, all lost more water vapour than similar leaves in the shade, in darkness, or in lower temperatures respectively, but the ratios of the losses were approximately the same whether chlorophyll was present or not. And though the green leaves showed themselwes rather more sensitive than the colourless ones to variations in the external conditions, the fact that all the leaves behaved in the same general way proved that the presence or absence of chlorophyll could not be the controlling factor in transpiration.

Lastly, a study was made of transpiration in succulent plants. In such plants water vapour is emitted only from the peripheral parenchymatous cells lying immediately below the epidermis, and in order to further reduce traspiration the membrane of these cells is almost impermeable, so that variations in temperature and light have a greatly reduced effect.

483 - **The Effect upon Plants of Boron Compounds** (1). - HASELHOFF, E. Mitteilung der landw. Versuchsstation in Harleshangen (Kreis Kassel). *Die Landwirtschaftlichen Versuchsstationen*, Vols. LXXIX and LXXX, pp. 399-420, + tables IV-VII, Berlin, 1913.

A critical review of the literature existing on this subject and of experiments in growing maize and French beans in solutions, and beans and oats in soil.

The writer comes to the following final conclusions :

1. Hotters' observations as to the formation of spots on the leaves as a result of the action of boron are confirmed; these spots occur even with a minimum quantity of boron in the solution in the soil, but no injurious effect upon the yield has been recorded.

2. The injurious effect of boron is clear; the upper limit of boron in solutious is probably 1 mg. per litre; this amount as borax increased the yield of French beans, thongh it had a bad effect on the appearance of the plants; under the form of boric acid, it had injurious effects on the yield also; larger amounts were decidedly harmful; 1.15 mg. of boron in 1 litre of nutritive solution had also clearly injurious effects on maize.

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(1) See No. 38, *B.* Jan. 1911 *(Ed.)*.

3. In cultures in soil, 1mg. of boron in 8 kg. of soil, *i.e.* 0.00001 per cent., had no bad effect upon the beans when applied in the form of borax, although it was injurious in the form of boric acid; in every case larger quantities were harmful. The preceding experiments suggested higher limits.

4. Some experiments, however, seemed to show a favourable influence upon the bulk of the crop, which is to be attributed to the stimulant action of these substances; but the limit for this beneficial action is below 0.00001 per cent. of the soil.

5. Although some experiments have shown that the action of boric acid was more injurious than that of borax, further experiments are necessary to decide whether this was due to the idiosyncrasy of special plants, as in general the effect of the two compounds is equal.

6. The assimiliation of boron, whether from solutions or from the soil, usually depends upon the amount present; it appears to be deposited in the stems and not in the grain.

7. Although the exterior effects shown by the spots on the leaves seemed alike in different plants, the action upon the yield was different; perhaps the discrepancies between the results of present and former experiments may be attributed to this fact.

484 - **Solanum Chimeras.** — MARCHAL, E.: in *Annales de Gembloux*, Year 23, No. 3, pp. 121-129. Brussels, March 1, 1913.

Winkler (1) has shown that when reciprocal grafts of nightshade and tomato are cut back to the point of union, composite buds may arise which develop into individuals exhibiting a curious mixture of the characters of the two associated species.

During 1912 the writer repeated Winkler's experiments at Gembloux, proceeding as follows: nightshade (*Solanum nigrum* var *guineense*) and tomato (*Solanum Lycopersicum*) plants were raised from seed sown in January, the plants being hardened off as much as possible before the end of April. The stem of the tomato was then cut 15 to 20 cm. (6 to 8 in.) from the earth level, leaving 4 or 5 leaves on the plant. The stems of the nightshade were cut in the shape of a wedge not less than 3 cm. (1.2 in.) long, and all the leaves were removed. The wedge-shaped stem was then fitted into a corresponding v-shaped cut in the tomato plant, and the two were bound together. After 15 to 20 days the tissues were completely united, and a transverse cut then made about 1 cm. (0.4 in.) from the top of the stock, leaving a rectangular piece of nightshade fused into the tomato stem. A large number of adventitious buds were immediately formed round the top of the cut stem, and in almost all cases they presented either pure tomato or pure nightshade characteristics according to their position; but amongst the 30 plants under observation, three cases of chimera were obtained. Where they occurred the other shoots were removed so that the monstrous shoots should benefit by the entire vigour of the plant, and they developed into forms such as have been described by Winkler.

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(1) H. WINKLER: Ueber Propfbastarde und pflanzliche Chimären (*Ber. d. D. Bot. Gesellschaft*, Bd. XXV, H. 10, 1907).

ID.: *Solanum tubingense*, ein echter Propfbastard zwischen Tomate und Nachtschatten (*Ber. d. D. Bot. Gesellschaft*, Bd. XXVI, H. 8, 1908).

ID.: Weitere Untersuchungen über Propfbastarde (*Zeitschr. f. Botanik*, Bd. I, H. 5, 1909).

ID.: Ueber die Nachkommenschaft der Solanum Propfbastarde und die Chromosomenzahlen ihrer Keimzellen (*Zeitschr. f. Botanik*, Bd. II, H. 1, 1909). (*Author's note*).

One, belonging to the so-called sectorial type, appeared to consist of the longitudinal fusion of the two species, for on one side of the plant the leaves were all pure tomato, while on the other they were all pure nightshade, and the line of demarcation was sharply defined all down the stem; in the one or two cases where leaves sprang from the point of fusion of the two sides of the stem, these leaves were divided along the mid-rib, on one side reproducing tomato, and on the other nightshade characteristics. At a certain height, the stem split into its two constituent parts which then dissociated completely. The nightshade flowered and fruited profusely, but the organism died before the tomato side had developed any flowers.

On another plant, there arose two buds in such intimate contact that they appeared to spring from a common origin; as the stock was dying a cutting was made of the buds, and later, the two individuals were separated. They both belonged to the periclinal type of chimera, and one of them resembled the *Solanum Kohlreuterianum* of Winkler. In general appearance the plant was very like a tomato, but the leaves were more simple, and the plant was glabrous. It did not, moreover, possess the aroma of the tomato. Flower buds were formed, but did not open, and the luxuriance of the vegetation was marked. The twin bud, as well as a single bud on yet another plant, developed into the *Solanum Gaertnerianum* of Winkler. The leaves were simple, very irregular in shape and surface, almost glabrous, and without the aroma of the tomato. The apices all tended to curve over, causing a kind of twist of the stem, and the intensity of the colour often varied between the depressed and raised portions of the surface. The whole appearance suggested a lack of harmony between the two symbiotes, and this was borne out on the physiological side by a great lack of vitality. No flowering took place, but Winkler obtained flowers and seeds from his specimens and the latter reproduced pure nightshade plants.

Cuttings were made of all these chimeras, and will be submitted to further experiments during the present season.

485 - **On Some Vegetative Anomalies of *Trifolium pratense*.** - KAJANUS, B. in *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, Vol. 9, Parts 1 and 2, pp. 111-133 + 8 figs. and 1 plate. Berlin, February 1913.

The writer speaks of the fasciation and yellowing (chlorosis) observed in red clover and finds a connection between these two phenomena.

486 - **Self Coloured Violet Seeds of *Pisum arvense*.** — KAJANUS, BIRGER: in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 5, pp. 153-160. Stuttgart, March 1, 1913.

From a variety of field pea (*Pisum arvense*), whose seeds were grey with violet spots, is derived a variety in which the violet colour is continuous over the whole or part of the integument, or is present in the form of stripes. For the latter variety the writer proposes the name *obscuratum*. The violet colour is due to a pigment dissolved in the cells of the palisade layer. From his cultures and observations (1909-1911) the writer concludes that: 1) the appearance of the violet coloration over the entire integument of the seeds of *P. arvense*, is a modification arising especially in spotted varieties; 2) this modification arises spontaneously, and is not due to any special external influence; 3) the frequency of the occurrence of self-coloured violet seeds can be increased in single plants by the separate sowing of such seeds.

487 - **Influence of Green Manuring upon Germination of Seeds.** — *Report of the Director*, 1911-1912, *University of Wisconsin Agricultural Experiment Station*, pp. 26-27. Madison, Wisconsin, January 1913.

In 1911 a southern student at the Wisconsin Agricultural College reported the failure of some ten acres of cotton to germinate, where it had been sown immediately after ploughing under green clover. On the other hand, on a similar field planted with the same seed, but which had not been green manured, normal germination occurred. Professor Hoffmann has accordingly begun a study of the effect of green manuring upon the germination of seeds subsequently sown. In pot tests in the greenhouse he has incorporated with the soil an amount of green clover corresponding to that applied under field conditions, and has then sown various seeds, in all cases sterilizing one series of pots, while another was allowed to remain in a normal condition.

" It has been found that the decomposition of the clover somehow affects cotton seed, but does not have any material effect on the germination of corn [maize], wheat, and clover. Two experiments conducted with flax have, however, shown a similar detrimental effect to that produced on cotton. The results so far secured indicate that the decomposition of green manures results in the reduction of the oxygen supply and an increase in the carbon dioxide present in the soil atmosphere. It is thought that this change in gaseons content of the soil prevents the germination of the cotton and flax seed, which contain a high percentage of oil, and so require more oxygen for germination than such seeds as corn, clover, and wheat. "

488 - **Effect of Fertility upon Variation and Correlation in Wheat.** — MYERS, C. H.: in *Proceedings of the American Breeders' Association*, Vol. 7, pp. 61-74. Washington, 1912.

PLANT BREEDING

A summary of the results obtained by other experimenters in this subject followed by an account of the writer's own work on a mixed population of Dawson's Golden Chaff. His results indicate that variation is greatest on the poorest soil, but more data must be accumulated before any definite conclusions can be drawn.

489 - **Xenia in Wheat.** — BLARINGHEM, L.: in *Comptes rendus de l'Académie des Sciences*, Vol. 156, No. 10, pp. 802-804. Paris, March 10, 1913.

Cases of xenia were observed in wheat when 1) *Triticum durum* and 2) *Triticum turgidum gentile* were used to pollinate *T. vulgare lutescens*. The hybrids of the second cross exhibited characteristics more accentuated than those of either parents and a hybrid-mutation appeared to have occurred.

490 - **Heredity of a Maize Variation.** - COLLINS, G. N.: *U. S. Department of Agriculture, Bureau of Plant Industry*, Bulletin No. 272, pp. 23, Washington, January 1913.

During the harvest of 1909, a single white ear of corn was observed in a field of Yellow Dent maize at Waco, Texas. From the general circumstances it appeared extremely likely that this might represent a mutation rather than a chance admixture, and the case was further investigated.

The seed from the albinistic ear was sown in 1910 ; one self-pollinated and two reciprocal cross-pollinated ears were obtained. Beside this, pollen from one of the parents used in the reciprocal cross was taken to pollinate three ears of White Dent, and one of another white-seeded variety named Hopi.

The seeds thus obtained were sown in 1911, the plants were selfed, the resulting ears carefully analysed.

It seems probable that the plant which produced the original albinistic ear received pollen from the surrounding yellow plants, and the first generation therefore represented a cross between white and yellow in which the former was dominant. This is a most unusual occurrence, and the dominance appears completely reversed in subsequent generations. In a general way the progeny of the albinistic ear can be said to have resulted in all shades of yellow with a pronounced tendency to fall into two groups representing 25 per cent. of white and 75 per cent. of yellow. This suggests a single Mendelian character ; but the segregation is incomplete, as many of the grains in the recessive class show traces of yellow. On the other hand the numbers do not fit any better under the assumption that two or more Mendelian factors are involved.

491 - **The Relation of Certain Ear Characteristics to Yield in Corn [Maize].** — LOVE, H. H.: in *Proceedings of the American Breeders' Association*, Vol. 7, pp. 29-40. Washington, 1912.

Studies made on two varieties of corn grown for two seasons. The results show that there exists a slight positive correlation between the length and the breadth of the ear, and the yield of the offspring ; but that the number of rows of grain on the ear, and the shape of the ear (cylindrical or tapering) do not have a marked effect on the yield.

492 – **The Production of New and Improved Varieties of Timothy.** — WEBBER, H. J.: in *Cornell University Agricultural Experiment Station, Bulletin* 813, pp. 339-381. Ithaca, N. Y., 1912.

A full report of the timothy breeding experiments carried out at the Cornell Experimental Station (1).

493 – **The Seed-Farm at Schlanstedt, Germany.** — DAMSEAUX A.: in *Annales de Gembloux*, Year 23, No. 8, p. 130. Brussels, March 1, 1913.

An account of the seed-farm belonging to the firm of Strube, including a description of the methods employed for obtaining races of cereals specially adapted to the conditions of North-Eastern Europe, and for improving the Kleinwanzleben sugar beet.

CEREAL AND PULSE CROPS

494 – **The Improvement of Indian Wheat** (2). — HOWARD, A. and HOWARD, G. L. C. (A paper read at the Punjab Agricultural Conference, Lyallpur, November 4, 1912). *The Agricultural Journal of India*, Vol. VIII, Part. 1, pp. 27-34. Pusa, January 1913.

A discussion of the results obtained by the two main lines of improvement:

1) Agricultural improvements consisting of hot-weather cultivation and dry-farming methods, combined where necessary with green manuring.

2) Improvement in the kinds of wheat grown, by which both quality and yield have been raised.

495 – **Svalöf Golden Barley ("Gullkorn")** — TEDIN, HANS: in *Sveriges Utsädesföreningns Tidskrift*, Year XXIII, Part I, pp. 27-50. Svalöf, 1913.

Svalöf Golden barley, which appeared on the marhet this spring for the first time, is a new pedigree variety, which has been selected from an old Swedish barley coming originally from the island of Gotland. It belongs to the *nutans* variety and the grain has the so-called β characters, the rachilla long-haired and the inner pair of nerves of the glume toothed. These characters are not variety characters, but only those of types or groups, but they are of great practical importance, since they in some measure make control easier; for the work of selection they have no direct importance.

The chief object of this Golden barley is to replace Svalöf Hannchen in general farm-practice; it agrees essentially with the Hannchen in several characters of practical importance; thus its stems scarcely reach medium height, and are slender, but strong and rigid; and its ears are relatively thick. The 1000-grain weight, the bushel weight and the time of ripening are also the same as for Hannchen. But Svalöf Golden is easily distinguished in the field from the fact that its ears become dark reddish before ripening and are completely drooping while those of Hannchen are either suberect or nearly horizontal; when threshed, besides the above-mentioned grain characters Hannchen belonging to the α-type with a long-haired rachilla and toothless nerves to the glume, the shape of the grain is better in Svalöf Golden, being short and plump, while Hannchen is somewhat elongated.

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(1) See No. 1514, *B.* Nov. 1912. (*Ed.*).

(2) See No. 357, *B.* April 1913 (*Ed.*)

In the comparative experiments made at Svalöf and at Ultuna in Central Sweden (Branch of the Seed Selection Association) the Golden barley has been tested since 1900. In addition, a number of local experiments have been made in different provinces of Southern and Central Sweden. In these experiments, as in all others carried out at Experiment Stations and on farms, the average grain yield of Svalöf Golden has in every case exceeded that of Hannchen. Though the difference is not particularly large, it is too regular to be the result of chance.

The other varieties tested were also more or less inferior in grain yield to Golden, Princess alone showed itself slightly superior in this respect upon one single occasion (at Alnarp in Schonen).

The straw yield of Golden is the same as that of Hannchen, thus considerably less than, for instance, in Princess and Chevalier.

Golden has the advantage over Hannchen of being less susceptible to smut.

As compared with Hannchen, Golden very soon reaches the state of "after-ripeness" or "germ-ripeness," so that it can be used for malting almost immediately after harvest.

496 - **Data concerning Varieties of Rice.** — CONNER, C. M.: in *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 86-92 + 3 diagr. Manila, February 1912.

This is a continuation of the study on varieties of rice of the Philippines (1). Diagrams are given comparing the behaviour of varieties grown in the Philippines with those grown in Indo-China as regards the time required to mature, the yields, the ratio between the dimensions of the grain (expressed by the product of the length by the width, in millimetres) and the number of grains per head or raceme, and between the dimensions of the grains and the yield per acre. The upland and lowland varieties are kept separate.

In one experiment, 279 lowland white varieties grown in Indo-China were compared with a like number of lowland white varieties grown in the Philippines, the tests being made in duplicate at two separate places. It was found that the greatest number of varieties experimented upon mature in six months from sowing. The average yield per acre does not increase with the number of months to maturity: in fact months to maturity bears no relation to yield. The number of varieties with exceedingly small or exceedingly large grains is very limited; also the smallest grains are found in the upland varieties only. Practically all of the upland varieties are non-bearded, while a large percentage of the lowland varieties are bearded, and the smallest grains are found among the non-bearded varieties.

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(1) See No. 27, *B.* Jan. 1913.

On grouping the varieties according to size of grains, the number of grains per head is found to be in inverse ratio to the size of the grain. Excepting for the very small and the very large grains the size of the grain has very little influence on the yield.

The greatest number of lowland varieties yield 1400 and 1500 lbs. of palay per acre, while the upland varieties vary within wider limits.

The upland varieties have as a whole longer and wider leaves, and many of them have smooth leaves, while the lowland varieties are catchy (40 per cent. of the upland and 1 per cent of the lowland have smooth, while the others have rough blades). Practically all the bearded varieties have rough blades. The upland varieties to not stool so freely as the lowland and as a rule have much larger and thicker culms or stalks.

497 - **Possibility of the Development of Rice Growing in Argentina.** - FALDINI JOSÉ: in *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1311-1350 + figs. Buenos Aires, 1912.

This paper is a report on a journey of study in the State of São Paulo, Brazil. Il gives a description of the methods of cultivating rice and of the successive treatment it receives, and of the introduction and development of this crop in Brazil. (In 1910, 2 962 586 bushels of rice were raised in São Paulo. It is also grown in the States of Rio Grande do Sul. Minas, Rio de Janeiro, and others.). The paper mentions also the legislative measures enacted to favour rice growing.

At present in Argentina rice growing is not very important. In 1911 5000 tons of rice were produced in the provinces of Tucuman, Salta and Jujuy, but it would be quite possible to produce besides the quantity required by the country; namely 50,000 tons, a certain quantity for exportation. To attain this object, however, some legislative and administrative measures would be necessary, such as the institution of an experiment station for rice, and the adoption of protective duties.

498 - **The Jack Bean and The Sword Bean.** — PIPER, C. V.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 110 (*Miscellaneous Papers*), pp. 29-36 + plate III. Washington, January 18, 1913.

The jack bean (*canavali ensiformis*) is a native of the West Indies and the adjacent mainland. It has been repeatedly tested in the United States as a forage plant, and the following are some of the results obtained, together with the publications containing the information.

Yield per acre	Publication
30 to 40 bushels beans	Mississippi Agric. Exp. Station, Bull. 39, 1896.
35 » »	Texas Agric. Exp. Station, Bull. 34, 1895.
40 » »	W. Carolina Agric. Exp. Station, Bull. 133, 1896.
16 to 20 tons of green fodder . .	Hawaii Agric. Exp. Station, Bull. 23, 1911.

In the Hawaii experiments, while the crop proved quite drought-resisting it responded well to irrigation.

In Porto Rico the jack bean has been found very useful as a green manure and cover crop in citrus groves. Judging from the behaviour of the plant in trials in Florida, it should prove equally valuable there. It has recently been introduced into Java, where, on account of the large yield of seed, the agricultural authorities were endeavouring to find a market for the product in Europe.

The value of the plant as forage is yet problematical. In experiments made at the Mississippi Agricultural Experiment Station to feed these beans to beef and dairy cattle, they were found to be unpalatable and undigestible.

The sword bean (*Canavali gladiata*) is found coltivated through much of southern Asia and also in Africa. At various times it has been introduced into America, but is still cultivated almost entirely as a curiosity or as an arbor vine. As forage it is not as desirable as the jack bean, as the foliage is as bitter and the habit inferior.

As a cover crop the Indian variety with red seeds and red flowers has proved very satisfactory in Porto Rico. Cattle are said to graze on the plant there to a limited extent.

In the South of the United States the sword bean is not infrequently seen, but the green pods are not used as a vegetable. Indeed the impression prevails that the seeds are deleterious. Such an idea is erroneous, as the sword bean is largely used as a vegetable in Japan, India, Burma, Ceylon, Java and Mauritius. The pods are best when about half grown. The plant does not mature freely as far north as Washington, D. C., but does produce an abundance of green pods in late September and early October. It seems well worthy of cultivation as a vegetable throughout the Southern States.

FORAGE CROPS.
MEADOWS
AND PASTURES

499 – **Elephant Grass (*Pennisetum purpureum*): a New Fodder Plant.** — STAPF, O.: in *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, No. 7, 1912, pp. 309-316. London, 1912.
The Rhodesia Agricultural Journal, Vol. X, No. 3, p. 368 (note). Salisbury, Rhodesia, February 1913.

In the June number of the Rhodesia Agricultural Journal for 1910, a new fodder grass was described as Zinyamunga or Napier's fodder, and in the autumn of the following year, specimens were sent to Kew for identification and samples were analysed at the Department of Agriculture, Salisbury, Rhodesia.

The grass was identified as *Pennisetum purpureum* Schum. (*P. Benthamii Steud.*), a species of very wide range in Tropical Africa where it is known under a variety of names amongst others as "elephant grass"; but, common as it is, very little is known about its life history and uses; and even its limits as a species and its differentiation into varieties are not settled. Though mentioned as a fodder plant by three other observers from 1905 onwards, it was quite independently of these sources that Mr. E. G. Kenny, Native Commissioner, Gutu, and Colonel Napier, of Springs, Bulawayo, first noticed the grass in the Gutu District in 1908, and two years later they published a short account of their experiments with it in the *Rhodesia Agricultural Journal.* They stated that it was a good drought resister, remained green on dry land late into the autumn, and withstood frost to a remarkable degree; further that it was relished by stock and evidently of considerable economic value.

In March 1910 a plot was planted in the Botanical Experimental Station, Salisbury, and tested against sugar cane. A first cutting was obtained in July 1911, and on analysis gave the following results:

	Sugar cane fodder per cent.	Napier's fodder per cent.
Water	73.63	61.81
Ether extract	.22	.29
Protein (Nitrogen × 6.25)	1.27	2.92
Carbohydrates	17.73	17.29
Woody fibre	5.32	14.77
Ash	1.83	2.92

The Napier fodder contains rather more nitrogen than the cane, but the stalks are far less juicy and the juice is of low sugar content; on the other hand it yields a rich ash, and this may be the meaning of the Gutu natives' statement that they plant it to "make the other plants grow." It is propagated like sugar cane by subdivision of the roots, by cuttings, or freely by slips and roots. Plants established at the Botanical Station in March 1911 were cut to ground level in August in order to provide cuttings for further propagation. The first cutting for forage was obtained in the following February, and subsequent cuttings were taken on March 30, May 30, and June 30. With the two former the growth was about 4 ft. in length, but with the two latter only about 2½ ft. No rain fell after the end of April, the total for the season being 21 inches. A few weeks after the June cutting, new growth appeared, and the plants remained green, with leaves several inches in length, throughout the whole winter, strong growth commencing again in October. Under similar conditions it is a more rapid grower and provides a greater bulk of succulent feed than sugar cane. Hitherto it has been grown in rows 3 by 2 feet apart and this seems a suitable spacing. Though its main value is undoubtedly as a soiling crop, as a perennial pasture grass it is by no means to be despised, and it can be recommended with confidence for trial on dry land.

500 - **Nonperennial Medicagos: the Agronomic Value and Botanical Relationship of the Species.** — Mc Kee, R. and Ricker, P. L. in *United States Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 267, pp. 38. Washington, February 1913.

At present the only non-perennial species of *Medicago* widely distributed in the United States are the spotted and toothed bur clovers (*M. arabica* and *M. hispida denticulata*), and yellow trefoil (*M. lupulina*);

but since 1898 about 60 species and varieties have been introduced for experimental purposes, and an account is given ot the progress of the work.

501 – **Cultivation Experiments with Leguminous Forage Plants in Argentina.** — TONNELIER, ADOLFO C. La *Soja hispida.* — *Boletin del Ministerio de Agricultura,* Vol. XIV, No. 11-13, pp. 1351-1357, Buenos Aires, 1912. — Ensayos con el Cowpea (*Vigna unguiculata*). — *Ibid.,* pp. 1358-1314 + table.

This paper reports upon cultural experiments conducted at the Experiment Station annexed to the "Escuela Nacional de Agricultura y Ganaderia de Cordoba"; it gives data as to the amount of green forage and of seeds obtained with several varieties, as to their analysis and food value. It states the most favourable time for sowing and for harvesting. It shows especially the advantage of obtaining a cut of forage by sowing after reaping a cereal and mowing in the autumn of the same year, that is, as a catch crop.

502 – **Keeping Soft Cuttings Alive for Long Periods.** – OLIVER, GEORGE W. in *U. S. Department of Agriculture, Bureau of Plant Industry,* Circular No. 111 (Miscellaneous Papers), pp. 29-31. Washington, February 1, 1913.

For the transport of soft or herbaceous cuttings, such as those of lucerne and clover, the writer recommends the following method:

Arrange a layer of cuttings without two much crowding, with the upper surfaces of the leaves on a piece of strong glass, and place 2 or 3 inches of living sphagnum moss evenly distributed over the cuttings. Place another layer of cuttings on top of this moss with the under surfaces of the leaves next to the moss, and on top of this second layer of cuttings place a second piece of glass. Press down firmly, and tie together with strong twine. If the moss is kept moist and all the light possible is given, the cuttings are not in the least injured. If the journey is long enough, say four to six weeks, lucerne and many other plants will root freely.

FIBRE CROPS

503 – **Fibre from Different Pickings of Egyptian Cotton.** — KEARNEY, THOMAS K. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No* 110, (Miscellaneous Papers), pp. 37-39 Washington, January 18, 1913.

Two pickings were made from cotton plants of the Yuma variety at Sacaton, Arizona: the first early in October, the second about a month later. The first picking consisted largely of the bolls borne on the lower fruiting branches of the main stem. The cotton of the two pickings showed the following differences:

	Picked in	
	October	November
Range of variation of length of fibre . .	3/16 inch	2/16 inch
Weight of fibre per 100 seeds	4.90 grams	5.17 grams
Weight of 100 seeds	12.9 »	13.4 »

Further, the fibre picked in November averaged one-sixteenth of an inch longer than that from the first picking; it was also generally stronger and finer.

The lighter weight of the seeds picked in October, and their colour, show that they were not thoroughly mature, and it is not unlikely that these seeds possess a lower percentage of germination.

Similar experiments were made at Bard, California, in 1911 with the same variety of cotton. But the first cotton ripened so early that it was picked in bulk about the bumiddle of September, thus eliminating the cotton from the early opening bolls near the bases of the plants. For this reason the cotton from the two pickings showed less difference at Bard than at Sacaton.

From these experiments it would seem advisable to make the first picking of Egyptian cotton as early as the number of open bolls will warrant the expense of the operation and to keep this fibre as a separate grade and not to mix it with the bulk of the crop which may be expected to show decided superiority in grade and quality. It is also probable that the latest cotton to ripen, especially that contained in bolls which open after a severe frost, should also be graded separately.

504 — **Durango Cotton in the Imperial Valley, California.** — COOK, O. F.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 111 (Miscellaneous Papers), pp. 11-22. Washington, February 1, 1913.

In the regions infested by the cotton boll weevil (*Anthonomus grandis*), the cultivation of the long-stapled cotton is seriously hindered by the fact that this cotton is mostly of late-maturing types, and consequently more severely injured by the parasite. The United States Department of Agriculture has therefore for several years past endeavoured to produce an early long-staple cotton. Among others thus produced the three following may be mentioned: Columbia, which was obtained by straight selection from a short-staple variety; Foster, obtained by crossing long and short staple varieties; and Durango by acclimatization and selection of an imported stock from the State of Durango, Mexico, and which belongs to the Upland type. Some long-stapled early cottons had been obtained and gave good results when the weather was favorable to them, but Durango showed greater power of adaptation and gave good yields where other varieties had failed. The Durango plant had an erect bearing; it is early and bears heavily; its bolls are large and they open well; its foliage is light and open. In the Imperial Valley in California, Durango was tested in experimental plantings in comparison with Columbia, Foster, Allen and Egyptian, and proved so much superior to all its competitors that the local cotton-growing community is making an organized effort to place the valley exclusively on a Durango basis.

505 — **Henequen.** — BOURGEOIS, HENRY: in *Annales Diplomatiques et Consulaires*, Vol. IX, Year 12, No. 160, pp. 9-10. Paris, January 1913.

Information respecting the production of Henequen in Mexico and statistical data as to the amount exported, the countries to which it is sent, and the value of the exports; together with information regarding a tax intended to form a "Defence Fund" for the purpose of hindering the influence exerted on the market by speculators.

506 - **New Zealand Flax *(Phormium tenax)* Refuse. Its Manurial Value.** - ASTON, B. C.: in *New Zealand Department of Agriculture, Industries and Commerce The Journal of Agriculture*, Vol. IV, No. 1, pp. 16-18. Wellington, January 15, 1913.

It has often been observed that cattle seem to find the leaves of *Phormium tenax* palatable, especially when these are young; it has therefore been suggested to utilize the refuse of the process of extracting the fibre as food for cattle. Others have proposed that if the sodium-sulphite process be used to obtain the fibre, the rejected portion of the leaves could easily be converted into papermaker's pulp. It has also been stated that the ash of the refuse would make a lye to be used for the partial cleansing of the fibre.

At the writer's suggestion experiments were carried out at the Weraroa (Levin), Ruakura (Hamilton), and Moumahaki Experimental Farms with flax waste used as manure. At Levin, on a clay soil resting on gravel, a potato plot dressed with 20 tons of flax waste per acre gave a crop somewhat inferior to that given by 2 cwt. of superphosphate. A 30-ton-dressed plot was very much better, being quite equal to the best of the artificially dressed plots.

At Ruakura the following results were obtained:

	20 tons refuse	10 tons refuse 2 cwt. bonedust 2 cwt. basic slag
Cost of manure *	£2 10s	£2 0s 6d
Yield per plot: potatoes	1 ton	10 cwt.
Yield per acre »	10 tons	9 tons 10 cwt.
Increase over unmanured, per acre	2 tons 7 ¼ cwt.	1 ton 17 ¼ cwt.
Value of increase with potatoes at £4 per ton . .	£9 9s	£7 9s 0d
Profit per acre due to manure	£6 19s	£5 8s 6d

* Allowing 2s 6d per ton for cartage.

At the Moumahaki Farm an experiment was made on a crop of mangels, with the following results:

	2 ½ cwt. Superphosphate 28 cwt. Flax waste	56 cwt. Flax waste
Cost per acre	£1 6*s* 6*d*	£1 8*s*
Yield per acre (roots)	79 tons 4 ½ cwt.	15 tons 8 3/4 cwt.
Yield per acre (tops)	9 tons 7 1/4 cwt.	4 tons 10 cwt.
Increase over unmanured, per acre	70 tons 11 ½ cwt.	7 tons 6 cwt.
Cost per ton of increase	4 ½ *d*	3*s* 10*d*

Comparing flax-refuse with stable manure it may be said that while containing similar amounts of water and phosphoric acid, the refuse contains larger amounts of potash and nitrogen.

The refuse in question has given excellent results in fields near the factories, on pastures (as top dressings) and on pumpkins. This manure has a special value for the country, as stock raising in stables is limited and consequently stable manure is rare.

507 – **The Cultivation of Kapok.** — DE WILDEMAN, E.: in *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 3, pp. 58-60. Antwerp, March 1913.

The writer records the appearance of a certain number of publications treating of this subject; he calls attention to the fact that the cultivation of *Eriodendron* depends largely on the climate and little on the soil. After giving, from data collected in Java by Mr. G. F. J. Bley, the cultivation expenses of a plantation of 300 bouws (525 acres), M. de Wildeman states that the Dutch consider Kapok cultivation to be only remunerative when practised by the natives.

508 – **Textile Plants.** – *La Quinzaine Coloniale*, Year 17, N°. 4, pp. 136-138. Paris, February 25, 1913.

A summary of the different data collected respecting the several varieties of *Hibiscus*. The writer avails himself of a memoir by A. Howard and G. L. C. Howard: Some New Varieties of *Hibiscus cannabinus* L. and *Hibiscus Sabdariffa* L. (*Memoirs of the Department of Agriculture in India, Bot. Series*, Vol. IV, No. 2). He mentions a study of *H. Sabdariffa* by P. J. Webster: Roselle, its Cultivation and Uses (*The Philippine Agricultural Review*, Vol V, No, 3. p. 123: Manila, 1912), and in conclusion, other sources of information respecting Gombo fibre, *viz.* T. F. Hanausek: Gambohanf (*Real enzyklopädie d. ges. Pharm.*, II edit., 1905, 5,511); v. Hohnel: *Microskopie der tecnisch verwendeten Faserstoffe* (Wien, II edit. 1905, 56); Matthews: *Textile Fibres* (New York, II edit., 1907, 308); Weisner: *Die Rohstoffe des Pflanzenreiches* (Leipzig, II edit., 1903, 2, 31).

In this recapitulation are given the native names given in India to *H. cannabinus* and *H. Sabdariffa*. Those of the former are: ***ambari, ambadi, pulu, mesta pat, darc Budrun, patsom, sherka, gogu, pundi, sigjada*** and ***sankukra***; those of the latter are: ***mesta patwa, bal, ambari,*** etc.

The Gombo hemp, known also under the names of Roselle, Madras hemp and Bimlipatan jute, has lately entered the European markets by way of England. Amongst the varieties of ***Hibiscus*** must also be mentioned: ***H. squamosus, H. esculentus*** and ***H. lunarifolius***; the last, from Northern Nigeria, produces the fibre called «ramma».

SUGAR CROPS

509 - The Composition of Beets in the Dry Year 1911 and the Effect of Late Rains upon Them.

— [URBAN, J.: in *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXVII, Part 6, pp. 303-308. Prague, March 1913.

On account of the drought and the heat, the year 1911 was very unfavourable to beets in Bohemia, especially so to those sown at the usual time in spring, which suffered from want of moisture during germination and thence on to September. It was only due to the autumn rains that the crop was enabled to attain from 40 to 60 per cent. of a normal crop.

The writer, availing himself of the weather forecasts of the meteorological stations issued at the beginning of September, which announced the approach of rain, set himself to study the changes that the rain would bring about in the beets. On September 13 he lifted 200 beets in the Station for the production of beet seeds at Větrušic near Prague. Rain began to fall on September 14, and by October 4, 81.7 millimetres had fallen. On this day 150 beets were lifted and analysed as the others had been.

The following table gives the results:

	Before the rain (September 13)	After the rain (October 4)
Average weight of fresh root . . . . . . grams	132.0	165.0
Dry matter in root . . . . per cent	22.7	20.7
Sugar content . . . . »	16.82	14.90
Weight of dry matter per root . . . . . . grams	30.0	34.1
» of sugar » » . . . . »	22.2	24.6
» of fresh leaves per plant . . . . . »	103.0	153.0
Dry matter in leaves. . . . . per cent	16.7	13.9

Composition of the dry matter.

	Root		Leaves	
	Before the rain	After the rain	Before the rain	After the rain
	grams	grams	grams	grams
Dry matter	30.00	34.10	17.20	21.30
Total nitrogen	0.44	0.42	0.56	0.70
Proteid »	0.23	0.24	0.38	0.54
K_2O	0.29	0.18	0.47	0.44
Na_2O	0.26	0.29	1.82	1.34
Ca O	0.08	0.14	0.32	0.42
Mg O	0.11	0.12	0.10	0.16
P_2O_5	0.09	0.08	0.07	0.10
SO_3	0.07	0.08	0.26	0.22

The above analyses show:

1) That the beets gathered before the rain, in spite of their leaves being yellow and wilted, were not mature. A confirmation of this view is found in the high total content of nitrogen (0.335 per cent. of the weight of the fresh root, whilst mature beets contain only 0.14 to 0.2 per cent. according to the soil, on average 0.17 per cent.) and especially of proteid nitrogen; in the great quantity of alkali in the root with a relatively low amount of lime. In such conditions the extraction of sugar in the factory would have been very difficult.

2) "Even when abundant rain falls later, a wilted beetroot plant cannot immediately absorb nutritive substances from the soil, owing to the want of root hairs; it first forms new hairs and rapidly builds up the necessary organs of assimilation at the expense of the nutritive substances, especially the potash in the beetroot."

3) "The capacity of the new leaves for forming sugar was limited during the month of September, owing to the prevailing climatic conditions, for only 0.62 grams of sugar were formed daily by 100 grams of the dry matter of the leaves, while in normal summers the daily formation of 1.82 grams of sugar during the month of September has been demonstrated."

4) "In beet plants grown during persistently dry weather considerable quantities of non-proteid nitrogen are stored, a great part of which, during the succeeding rainy period, is transformed into proteid nitrogen. Consequently upon such formation of proteid nitrogen at the

expense of the remaining nitrogen (difference between the total and the proteid nitrogen) and upon the migration of the nutritive substances into the root hairs and eventually into the new leaves, the juice of the root acquires a composition which renders it more favourable to treatment in the sugar factories.

510 - **Experiments made in the Experiment Fields of the Djokja Sub-Section of the Experiment Station of the Java Sugar Industry in 1911.** — VAN DEVENTER, W., HOUTMAN, P. SCHAIT, J. and ECKER, E. E. in *Archief voor de Suikerindustrie in Nederlandsch Indië*, Year XXI, Part 6, pp. 121-172 + 1 plate. February, 1913.

A report of the experiments made in 1911 on the sugar cane at the Djokja Sub-Section of the above-mentioned Station.

The following were the subjects of the experiments: *a*) manuring with various quantities of sulphate of ammonia; *b*) potash manures; *c*) manuring at different seasons; *d*) phosphatic manures; *e*) ashes as manure; *f*) molasses as manure; *g*) scum from sugqr factories as manure; *h*) comparison of canes of different origins; *i*) different intervals of planting; *j*) various varieties of canes; *k*) various. The method of experiment is described and analyses of the soil are given.

511 - **Manuring Experiments with Sugar Beets in Hungary.** - PÓLYA, JOZSEF in *Köztelek*, Year 23, No. 17, p. 573. Budapest, March 1st, 1913.

A long series of experiments made every year at Tavarnok (County of Nyitra) on the estate of Baron Stummer.

A. Experiments on three experimental fields of 14.22 acres on moderately heavy clay soil. The previous crop had received stable manure over the whole extent of these three fields and the soil was tilled in the same manner. The following table gives the results and data of the experiment.

Fertilisers per acre	Yield per acre	Excess over control	Gross return per acre	Cost of fertilisers	Net return	Excess of net yield over control
	lbs.	lbs.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
I. Control	18 603	—	10-10-10	—	10-10-10	—
II. Superphosphate. 232 lbs.	23 564	4 961	13- 7- 0	7- 5	12-19- 7	2- 8- 9
III. Superphosphate. 232 » Nitrate of soda . 43 »	26 045	7 442	14-15- 3	11- 5	14- 3-10	3-13- 0

N. B. The value of sugar beets is estimated at 1s 6.8d per cwt. ard the cost of the superphosphate and of the nitrate of soda at 4s 5d and 14s 4½ per cwt. respectively.

These experiments show that the sugar beet is extremely responsive to the effect of chemical manures, especially to that of superphosphate and of nitrate of soda.

B. Experiments with fertilizers in drills on three fields each of 14.22 acres.

Fertilizers per acre	Yield per acre	Excess over control	Gross return per acre	Cost of fertilizers	Net return	Excess return over control
	lbs.	lbs.	£. *s.* *d.*	£. *s.* *d.*	£. *s.* *d.*	£. *s.* *d.*
I. Control	18 735	—	10-12- 3	—	10-12- 3	—
II. Superphosphate 232 lbs., spread.	22 125	3 390	12-10- 8	7- 5	12- 3- 3	1-11- 0
III. Superphosphate 116 lbs , in drills	22 393	3 658	12-13- 9	3- 8½	12-10-½	1-17-9½

These figures show that fertilizers drilled in give a larger return than when they are spread.

On the other hand, the crops of barley raised on the same fields, after the sugar beets, showed that the effect of fertilizers in the drills only lasts one year, while if the fertilizer is spread, its efficacy is extended to the second year.

Fields	Yield per acre	Price per 100 lbs. £. *s.* *d.*	Value £. *s.* *d.*
I	1 923 lbs.	6 - 10	6 - 11 - 4 ¾
II	2 155 »	—	7 - 7 - 3
III	1 937 »	—	6 - 12 - 5

The writer advises a combination of the two methods of applying manure, in the following manner: the spreading, for instance, of two-thirds of the 232 lbs. of superphosphate and the drilling in of the rest with the seed. In this way, the sugar beets would receive enough nutritive substances and would leave a sufficient amount for the succeeding crop.

C. Experiments were made by growing autumn wheat on three experimental fields each of 21.31 acres (the soil being a moderately stiff clay) to ascertain whether bone meal could rival superphosphate as a fertilizer under the conditions prevailing in Hungary.

The results per acre were as follows:

Fields	Yield
I Control	2012 lbs.
II Superphosphate 232 lbs.	2310 »
III Bone meal 209 lbs.	2177 »

Taking these results as a basis, the writer considers that, under the given conditions, superphosphate is more to be recommended than bone meal.

512 – **Preliminary Report on Sugar Production from Maize.** – CLARK, C. F.: in *U. S. Department of Agriculture, Bureau of Plant Industry*. Circular No. 111 (Miscellaneous Papers), pp. 3-9. Washington, February 1, 1913.

The experiments were conducted at Garden City, Kansas and at Washington, D. C. The variety used at Garden City was Stowell's Evergreen sweet corn. It was planted on May 15 and the ears were removed on August 9 when in the milk stage. For the Washington experiments a dent corn, a selection of the Boone County White, was used. It was planted about May 30 and the ears were removed on August 22. Tables are given showing the results of the analyses of the corn stalks (from some of which the ears had been removed, while on the others they had been left) gathered on different dates. Experiments were also made on extra pressing the stalks and on the clarification and evaporation of the juices.

In conclusion, the experiments show that the removal of the immature ears from maize stalks greatly increases the sucrose content of the juice. There is also a small increase in non-sugar solids and a very pronounced increase in purity. The percentage of invert sugar is not materially affected.

Comparision of corn with sorghum and sugar cane as a source of sugar.

Plant source	Solids	Sucrose	Invert sugar	Non-sugar solids	Purity
	Per cent.	Per cent	Per cent.	Per cent.	Per cent.
Maize:					
Grown at Garden City:					
Ears removed	16.37	10.44	—	—	63.81
Ears not removed	11.53	5.05	—	—	48.43
Grown at Washington, D. C.:					
Ears removed	14.21	8.71	2.09	3.41	60.68
Ears not removed	8.13	3.31	2.13	2.69	38.55
Sorghum (average of 20 analyses, 4 varieties) . . .	14.11	9.11	0.82	4.18	64.48
Sugar cane:					
Louisiana (3 varieties) . .	15.30	12.15	1.35	1.78	79.19
Hawaii (17 varieties) . . .	17.86	15.59	0.43	1.84	87.28

The purity coefficients of the juices are relatively low, the highest being 67.4 per cent. As a sugar-producing plant maize compares very favourably with sorghum in the chemical composition of its juice, but it is much lower than sugar cane in sucrose and purity as will be seen by the table given on the opposite page.

These preliminary studies have been carried out with only two varieties of maize. Other varieties might give more, or less, favourable results. Besides, maize responds to selection for specific purposes, and it is possible that results achieved in the selection of beet might be paralleled with the proper selection of maize.

513 – **A Short Review of the Sugar Industry in the Philippine Islands.** – CONNER, C. M,: in *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 74-80 + fig. Manila, February 1913.

The cultivation of sugar cane and the art of making sugar were already establised in the Philippines when these islands were discovered. From the provinces of Pampanga and Batangas, where sugar making was first carried on, it spread to the other islands.

Sugar cane is grown on every kind of soil, from the light sandy soil of rather low natural fertility of Pampanga to the black, heavy, very retentive clay of Laguna and Batangas, or the volcanic and fertile soils in the neighbourchood of the Taal volcano and the Occidental Negros. In Occidental Negros the average yield of sugar is 2046 lbs. per acre. This average though is lowered by the number of fields poorly managed and of fields of low fertility planted to cane. On well managed plantations the yield per acre will rarely fall below 24 piculs (3389 lbs.), and frequently comes nearer 28 piculs (3925 lbs.). Commercial fertilizers are not used to any extent on sugar cane. Mostly some kind of rotation is followed : in Pampanga and Tarlac rice and corn are planted after the cane crop. In Negros it is the custom to allow the fields to be idle for a year and to pasture the stock on them.

The number of varieties of sugar cane found in the Philippines, prior to the organization of the Bureau of Agriculture, was very limited. The native cane ordinarily grown in Negros is, in respect to the richness and purity of its juice, an excellent cane, and having in addition a comparatively low fibre content it lends itself very well to milling. Many new varieties have been tested during the last twenty years, but only a few have given satisfaction. Some new varieties introduced from Hawaii in 1910 were grown by the Bureau of Science ; the following results were obtained at Alabang, province of Rizal :

Analysis of varieties of sugar cane.

Names of varieties	Juice	Polarisation	Brix	Coefficient of purity	Names of varieties	Juice	Polarisation	Brix	Coefficient of purity
	%	%				%	%		
H 16	75.8	14.3	16.3	87.8	H 227.	78.3	14.1	15.9	88.8
H 20	90.3	18.3	19.3	94.9	H 309	93.2	14.9	17.1	87.6
H 27	77.3	17.0	17.9	95.0	Native cane . . .	78.8	19.9	20.7	96.5
H 69	81.8	12.9	15.0	86.0	Negros Cane. . .	89.9	18.4	20.3	90.3

The Hawaiian varieties ripened in Alabang much earlier than in their home. The larger-growing varieties have not met with popular favour among the small planters in the Philippines, first because the stalks were too big for the small mills to handle, and then because the larger varieties would not respond properly to the native methods of cultivation. The native cane is planted in rows varying from 20 to 40 inches apart. Canes thus planted check the growth of weeds and grasses, but do not produce the greatest amount of sugar per acre. Some of the more progressive farmers are planting the native cane in rows 50 and 70 inches apart.

Until recently the extraction of the sugar was carried out with primitive methods and plant. Lately one large central mill has been erected at Mangarin, Mindoro. It is capable of grinding 1200 tons of cane in twenty-four hours. Two mills of like character are being built, one near Calamba, Laguna, and the other at San Carlos, Occidental Negros.

514 - **Varieties of Sugar Cane tried at the Experiment Station of the "Escuela de Arboricultura y Sacarotecnia" at Tucumán, Argentina.** — SIMOIS, DOMINGO L.: in *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1635-1637. Buenos Aires, 1912.

In the five years between 1908 and 1912, 82 varieties of sugar cane were tested at the above station. The varieties Roxa 15, Tamarin 21, Bois Rouge 26, Cayana 48, Verde de las Antillas 50, Sin nombre 52, Sin nombre 58, Sin nombre 65, Riscada de Santa Barbara 74, and 76 Java 234 were distinguished for their sugar content; Cayana Roxa, Verde de las Antillas 50, Sin nombre 52 and 58, and 76 Java 234 for their resistance to *Bacillus sacchari* (polvillo), though no completely resistant variety exists; the same varieties with the exception of Sin nombre 52, for their relative resistance to the attacks of *Diathraea saccharalis* (perforador); the varieties Roxa 15, Tamarin 21, Bois rouge 26, Sin nombre 52 and 58, Riscada de Santa Barbara 74, and 76 Java 234 for their resistance to sudden falls of temperature, which in Tucuman constitute the chief risk in sugar cane growing.

On the whole, 76 Java 234 is, of all the varieties tested, the one most to be recommended. In three analyses of this cane the percentage of saccharose ranged between 11.75 and 15, the purity between 83.33 and 89.82, and the industrial value from 9.79 to 13.47.

515 - **The Extraction and Use of Kukui Oil.** WILCOX, E. V. and THOMPSON, ALICE R.: *Hawaii Agricultural Experiment Station, Honolulu, Press Bulletin* No. 39, pp. 8. February 8, 1913.

OIL CROPS.

Kukui (*Aleurites triloba* or *A. moluccana*), is generally distributed throughout Polynesia, Malaysia, Philippines, Society Islands, India, Java, Australia, Ceylon, Bengal, Assam, China, Tahiti and Hawaii. It has been introduced into the West Indies, Brazil, Florida and elsewhere. In Hawaii kukui is common on all the islands, being the dominant native tree of the lower mountain zone. The oil expressed from the kernel of the nut is a drying oil and dries more quickly than any other known oil. It is suitable for use in the manufacture of soft-soap, oil-varnishes, paints, linoleum, etc., for burning, and as a wood-preservative; it is used medicinally as a plaster and as an article of diet.

At one time the exportation of kukui oil from Hawaii amounted to as much as 8 000 to 10 000 gals. per year; the greatest production occurred from 1840 to 1850; at that date the oil was valued at 50 cents per gallon.

The total area of kukui in Hawaii is estimated at from 10 000 to 40 000 acres; 15 000 acres may probably be assumed as a safe estimate. At the rate of 80 trees per acre and 200 lbs. of nuts per tree, there would be a yield of 8 tons of nuts per acre. A conservative estimate would be 5 tons of nuts. If we assume that not more than 10 000 acres of the area of kukui are readily accessible, the yield would be 50 000 tons, which would produce 2 375 000 gallons of oil.

According to laboratory experiments of the writer it would require 210 tons of nuts to produce 10 000 gals. of oil weighing 7.36 lbs. per gallon.

The kukui is practically free from serious insect pests or fungous diseases, and bears an annual crop of nuts without fail. From the writer's experiments it appears easy for a man, woman or child to pick up 500 lbs. of nuts per day. At 30 cents per 100 lbs., the labourer would receive $ 1.50 for a day's work. The kernel equals 30 per cent. of the weight of the nut; the average oil content is 65 per cent. of the kernel, or about 19.5 per cent. of the nut. In the Sunda Isles, where kukui oil is an important article of export, experiments have shown that 90 per cent. of the oil, equalling 17.5 per cent. of the weight of the nuts, is obtained by commercial methods through the use of presses. From 100 lbs. of nuts 17.5 lbs. of oil would be obtained, or a value of $ 1.75 at 10 cents per lb. Only an extremely small percentage of the nuts spoil or turn rancid even after lying two years on the ground. The spoiled nuts float in water and may thus be easily separated from the sound ones.

Kukui oil may be obtained by grinding the kernels and applying pressure with or without previous roasting of the nuts.

Chemistry of kukui oil.

Specific gravity	0.92 at 15.5° C.
Saponification value	179.1
Iodine number	155.5
Hehner value	89.9
Soluble acids	1.71
Reichert-Meissl number	2.82

Constituents of the kukui kernel.

	Fresh nuts
Moisture	7.14 %
Fat	66.25 »
Ash	3.05 »
Protein	19.88 »
Fibre	1.39 »
Nitrogen-free extract (by difference)	2.29 »

The press-cake is unusually rich in nitrogen (46 to 48 per cent. of protein), phosphoric acid (about 4 per cent. P_2O_5) and potash (1.5 to 2 per cent. K_2O). It therefore has a high value as a fertilizer, but it cannot be used as fodder as it has a poisonous effect upon stock.

516 – ***Canarium polyphyllum*: a New Oil Fruit from German New Guinea.** – KRAUSE, M.: in *Der Tropenpflanzer*, Year 17, No. 3, pp. 147-150. Berlin, March 1913.

Canarium polyphyllum (Burseraceae) is frequent all over New Guinea. In the islands of the Malay archipelago there are several species of *Canarium* from which is obtained the oil known in trade as « Kanariaöl », « Javamandelöl », «Huile de Canaria », « Java almond oil » and « Jungle badam » (Hindostan).

In size and shape the fruit of *C. polyphyllum* resembles a walnut.

The writer extracted, by means of ether, the fat from fruits received from German New Guinea, and obtained the following results:

	Canarium polyphyllum
Weight of 10 nuts with their woody shell	93 grams
Weight of 10 kernels	21 »
Fat in kernels, per cent.	68.23
Nitrogen in residue after extraction with ether, per cent.	9.77
Equivalent to protein	61.06
Values of the fat:	
Solidifying point	19 to 20° C.
Melting point	30° C.
Refractive index at 21° C.	1.475
Acid value	226
Saponification value (Koettstorfer)	200.2
Iodine value	59.74
Reichert-Meissl value	4.41

Feeding experiments have shown that neither the kernels nor the press-cake of *C. polyphyllum* contain injurious substances; and the fruit is eaten by the natives of New Guinea. The press-cake is rich in proteins and is thus a concentrated food. The fat has no unpleasant flavour and can be used for the preparation of margarine and the like.

RUBBER, GUM AND RESIN PLANTS

517 – **Cuttings or Stumps for planting Hevea** (1). — WEBER, A. J. C. Plançons contre Stumps. — *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 3, pp. 49-50. Antwerp, March 1913.

The writer discusses the advantages and disadvantages of the two methods of making Hevea plantations: by cuttings or by stumps. The first is the more costly, but M. Weber thinks it has so many advantages, that he prefers it to the stump method. He recommends the germinated seeds being planted in a nursery about 2 ft. by 2 ft. apart.

518 – **Iquitos, and the Tributary Region. The Rubber District of the Amazon.** – *Peru To-Day*, Vol. IV, No. 10, pp. 537-546. Lima, January 1913.

The article under review is an abstract of a report of Mr. Stuart J. Fuller, American Consul at Iquitos, who has made a joint investigation of the Putumayo region with Mr. G. B. Mitchell, the British Consul, and Mr. Carlos Rey de Castro, the Peruvian Consul at Manaos, Brazil.

Iquitos is the capital and principal town of the Department of Loreto, which includes most of Trans-Andean Peru and has an estimated total area of 288 500 square miles. The climate is warm and moist, the average temperature being from 80 to 88° F. Rains are frequent and abundant, aggregating 60 to 75 in. in a year. A vast region of tropical forests, traversed by the Caqueta (Yapura), Putumayo (Ica), Napo, Maranon, Tigre, Pastasa, Morona, Santiago, Javary, Ucayali, and Kuallaga river systems, all affluents of the Upper Amazon, is commercially tributary to Iquitos. As may be seen from the following table, almost the only product of the district is rubber; all supplies are imported.

Exports from Iquitos in 1911.

Rubber: Fine	1 481 037 lbs.
Entrefine	205 947 »
Scrappy	595 936 »
Slab	85 462 »
Peruvian ball	1 472 892 »
Weak fine and tails	748 590 »
Hides	43 623 »
Vegetable ivory (« tagua »)	991 165 »
Panama hats	117 dozen
Raw cotton	286 lbs.

The export of rubber for the first six months of 1912 reached a total of 2 975 555 lbs., and that of vegetable ivory for the same period 1 430 460 lbs.

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(1) See No. 1630, *B.* Dec. 1912. (*Ed.*).

There are a large number of *Phytelephas macrocarpa* palms growing wild in the forests of the territory tributary to Iquitos. The trade in the nuts of this palm (vegetable ivory, also known as «tagua», «marfil végétal» and «corozo nut») is developing. Trade in cinchona, salsaparilla and other drugs has entirely ceased. Valuable woods are to be found in the forests, but there is no trade in them owing to failure in transportation facilities. Experiments are being tried on a small scale in the cultivation of cotton, coffee and cacao, but these are as yet of no commercial importance.

The rubber produced in the district of Iquitos is classified as «jebe» and «caucho». «Jebe» is divided into lowland — fine (smoked), entre-fine (smoked), scrappy (not smoked), and highland — weak fine (smoked), and weak scrappy (not smoked). «Jebe» is obtained from *Hevea braziliensis*, trees which grow close enough together to enable the worker to handle a group of one hundred trees, called an «estrada» (walk) a day, visiting and tapping them. One man can manage two «estradas» on alternate days. The quality of the jebe varies according to soil and method of preparation. If grown on land high enough not to be flooded, it is weak, though it may be fine — *i. e.*, it has a fine texture but breaks at a lower strain than that grown on periodically submerged land, which is known as fine without the qualification of weak. Entre-fine is lowland rubber, but not so well prepared as the fine. Sernamby or scrappy is from milk which has coagulated without being smoked, and is more brittle.

«Caucho» comes from *Ficus elastica*, which grows scattered and solitary in the forest, usually on the higher land and at some distance from the rivers. The tree is not tapped but is cut down, and the sap runs out to form a pool in a hollow in the ground or in a bowl or basin. Little caucho is left on the rivers to the northward of Iquitos. Ball, or «sernamby de caucho», is caucho that has been coagulated without any treatment, and then cut into strips and the strips wound into balls. Slab is caucho coagulated without smoking by a special process which involves mixing it with a kind of green liana, soap or other diluents.

From the Javary River district comes fine, weak fine, weak scrappy and ball rubber. The caucho is fairly well worked out there; the same applies in the Napo and Tigre, which were once great sources for ball, though a good deal of caucho is still available in the Ecuadorian reaches of the Napo. The rubber from the Putumayo district is called Putumayo «tails». It is prepared in a different way from that on the other rivers. Not much rubber comes in directly from the Marañon, but what is found there includes all the grades of caucho and the weak varieties of jebe.

The export duty on rubber is fixed at 8 per cent. *ad valorem* calculated on the selling price at Liverpool.

It is generally felt that the quality of Peruvian rubber is so good that it can hold its own against the production of other regions, particularly cultivated rubber. The methods of extraction are fairly good, but there is room for improvement in the elimination of impurities.

All the Amazon rubber must be washed before it is used in the processes of manufacture, Peruvian fine losing 12 to 20 per cent. and scrappy 25 to 50 per cent. on account of their moisture content.

519 – Tobacco in Great Britain and Ireland. — ELLIS, R. British-grown Tobacco. *The Journal of the Board of Agriculture*, Vol. XIX, No. 11, pp. 904-908. London, February 1913.

VARIOUS CROPS

Tobacco growing in Ireland may be said to have passed its experimental stage; the commercial possibilities of the crop are proved, and though Irish tobacco is subject to the same excise duties as imported tobacco, the present growers are in receipt of a subsidy for a determinate period. The official returns show that 61 881 lbs. were produced in 1911, and the price obtained on the market was from *4d* to *7d* per lb.

In England, Scotland, and Wales, home-grown tobacco is subject to the same excise duty, but the Finance Act of 1910 provided for a rebate of one-third of the duty of 3*s* 6*d*, *i. e.* 1*s* 2*d*, per lb. upon 100 acres in England and Wales, and 50 acres in Scotland to be grown during the years 1911-12-13. In 1911 approximately 1000 lbs. of tobacco were grown and cured in Scotland, and 300 or 400 lbs. in different parts of England. During 1912 about 40 acres were under tobacco in Great Britain; taking an average yield of cured tobacco at 1 100 lbs. per acre, the estimated weight of the crop may be taken at 44 000 lbs.

This being the first English crop of any commercial importance, considerable interest is being evinced as to results; so far the crop appears to have come through well, and the quality shown in the final process of grading and rehandling preparatory to packing, seems to be of a satisfactory order. The tobacco is still in the growers' hands, and so far but little has been sold excepting the Welsh crop, which has been disposed of at a satisfactory figure.

520 – The Data obtained in 1911 respecting the Use of the Products of Crosses of Heavy-Leaved Species of Tobacco Resistant to *Thielavia basicola*. — ARIELLI-DONNARUMMA. *Ministero delle Finanze, Direzione Generale delle Privative, Bollettino tecnico della Coltivazione dei tabacchi pubblicato per cura del R. Istituto Sperimentale in Scafati (Salerno)*, Year XI, No. 6, p. 286 + 1 table. Scafati, 1912.

This is a general review of the industrial results obtained by cultivating coarse-leaved hybrid tobaccos resistant to *Thielavia basicola*. Some of these crosses unite agricultural and industrial advantages, which make them preferable to the Kentucky variety. The "Agenzia dei Tabacchi" is going to institute the cultivation, on a large industrial scale, of Italia × Kentucky and Salento × Kentucky.

521 – **Production and Consumption of Cocoa.** — PERROT, E.: in *Voordrachten over Koloniale Onderwerpen gehouden ter Gelegenheid van de Koloniale Landbouwtentoonstelling te Deventer*, pp. 167-182, Deventer, January 1913.

The writer gives a complete account of the cocoa industry, including its history, a description of the different species and varieties of cocoa plants, details of cultivation and of the various processes of fermentation, washing, and drying which the kernels undergo before being ready for the market; and then he passes on to consider the production and consumption of cocoa in the world.

Up to 1870, the producing area was restricted to Central America, Brazil, Mexico, and the Antilles; but cultivation trials were beginning in the Island of San Thomé, which after 40 years was to become one of the great centres of production. More remarkable still has been the growth of the industry in the Gold Coast, for here as late as 1899 the production was nil. At the present time the exports are as follows.

	Tons.
America :	
Brazil	33 180
Ecuador	30 150
Trinidad	22 881
Venezuela	16 615
San Domingo	14 578
Grenada	6 256
Others	11 362
	135 022
Africa :	
Gold Coast	22 104
San Thomé	29 137
Fernando Po	2 626
German Colonies	3 345
Belgian Congo	689
	57 901
Asia :	
Ceylon	3 472
Dutch Indies	2 410
	5 882

Africa is rapidly taking the place of America as the chief cocoa producing area of the world, and it is interesting to examine the average yields obtained in the two regions. In Africa 3½ to 4½ lbs. is obtained from a single tree, and very frequently the figures are even higher, whereas in America, for no apparent reason, the average yield is only 2½ lbs. The larger African crops are obtained both when cocoa is cultivated on large estates, as in San Thomé, Fernando Po, and Kamerun, and also when it is in the hands of the small native cultivators, as in the Gold Coast.

Whilst the African production has been increasing with astonishing rapidity, the total consumption has advanced in a no less remarkable manner; figures for 1894 and 1910 are given below.

	1894	1910
United States	7 806	49 490
Germany	8 184	43 224
England	9 789	23 687
France	14 629	24 661
Holland	9 499	15 926
Switzerland	2 081	8 853
Italy	639	1 859
Spain.	6 616	5 430
	59 243	173 130

In 16 years the consumption has trebled itself, but it is evident that this increase cannot go beyond certain limits; as the culture is spreading in all the West Coast of Africa, these limits will probably be reached in the course of a few years, after which time only those regions which are naturally best situated to the cultivation of the plant will continue to yield profitable returns.

MARKET GARDENING

522 ½ – **Horticulture in 1918.** - PASSY, PIERRE: *La Vie Agricole et Rurale*, Year 2, No. 13, pp. 349-353. Paris, March 1, 1913.

The writer passes the following subjects quickly in review: climatic conditions; horticultural shows; economic questions; exportation to America; the importance of bulb growing in Holland; the effect upon plants of tarring the roads; plant diseases («plomb» and chlorosis); chemical fertilizers (sulphur and manganese); horticultural methods (Lorette pruning system); asexual hybrization and xenia; horticultural novelties (roses, other flowers, vegetables); the instruction of girls in horticulture (a school established at the École Nationale at Grignon).

FRUIT-GROWING

523 – **Winter Pruning of Stocks Preparatory to Grafting on the Spot.** - VIDAL, J. L.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1006, pp. 429-433. Paris, March 27, 1913.

On the approach of spring, part of the reserve products which were accumulated in the autumn in the roots of the vine ascend and migrate towards the shoots; thus it is easy to understand that those vines from which the shoots have been removed in December will be better supplied with carbohydrates in the spring than the unpruned plants. As far as grafting is concerned, the larger the supply of reserve-material the more numerous the grafts which take and the better do these do. The comparative analyses of three young 1202 vines made in May 1911 gave the following results:

	Weight % of fresh material	Carbohydrates per 100 parts dry material	Carbohydrates per 100 parts fresh material	Date of cutting
Plant not cut back	34.5	23.61	8.14	May 23, 1911
Plant cut back in April 1911	38.7	26.90	10.32	May 23, 1911
Plant cut back early in January 1911	41.2	28.00	11.53	May 15, 1911

Thus the uncut vine is much the poorest in reserve substances at the time of grafting, while that cut back in January is the richest of the three. The logical deduction therefore is that it is advantageous to reduce to the minimum, from December, the shoots of stocks destined for grafting on the spot in the following spring. Practical experience has confirmed the theoretical conclusions, and the writer deduces from his experiments in the open that the following advantages result from the winter pruning of stocks to be grafted on the spot:

1) The increased vigour of the grafts which have taken, very noticeable when the buds are breaking, but always perceptible throughout the vegetative period.

2) More complete binding, due to the greatly increased activity of the tissues of the stock, subsequent to grafting.

3) Higher proportion of successful grafts.

4) Much lower proportion of mortality among the stocks in the case of unsuccessful grafts. More vigorous sprouting of the stocks, allowing more certain and satisfactory re-grafting of failures in the following season.

The grafting technique is very simple; it is only necessary to suppress the shoots by cutting them at the lowest eye. The essential point is that the pruning should be effected as far as possible between the 15th of December and the 15th of January. The most careful vine-growers will derive the most profit from this preparation of the stocks, for as a rule their vines are the most luxuriant and the good effects of cutting back are in direct proportion to the strength of the stocks.

524 - **Variation of Yield of Grafted Vines with Age.** - Ravaz, L.: in *Le Progrès agricole et viticole*, Year 30, No. 9, pp. 257-262. Montpellier, March 2, 1913.

M. Ravaz, in commenting upon the two tables giving the production for 28 consecutive years of vines now 33 years of age (experiment field at Mas de Las Sorres, near Montpellier), writes as follows:

"The deterioration of the grafted vine, when it occurs, is not due to grafting, nor is it generally to be attributed to age. It is the result either of phylloxera, in the case of all non-resistant varieties, or of the unsatisfactory conditions of the soil or subsoil; in deep, good soil, the life of the vine is, so to say, indefinitely long; but in poor or very calcareous soil, or where the subsoil is too clayey, or too wet and impermeable, the vines soon begin to fail, after having done well for a shorter or longer time, no doubt as long as most of the roots were in the good superficial soil."

525 – **Vineyard Reconstitution and New Stocks.** – GERVAIS, P.: in *La Vie Agricole et Rurale*, Year 2, No. 14, pp. 386-391. Paris, March 8, 1913.

In this report presented to the "Société des Viticulteurs de France" (general meeting of February 1913), the writer specifies the principles of vineyard reconstitution which are now considered as established and as forming the essential basis of modern vine growing.

He then proceeds to lay great stress upon the importance, in the light of experience, of preserving such of the old stocks as merit retention, having entirely fulfilled their early promise, and those new-comers which deserve, or appear to deserve, a place among the older ones.

526 – **On the "Localization" of Direct Bearers.** – ROY-CHEVRIER, J.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 269-271. Paris, February 20, 1913.

According to the writer, the success of direct producers chiefly depends upon their "localization", *i. e.* the judicious and wise selection of stocks which are themselves suited in all essential respects to the special climatic and cultural conditions of a given district.

527 – **Imbedding Whip-Grafts of Vines in a Hot Chamber.** — CHAPPAZ, G.: in *Le Progrès Agricole et Viticole*, Year 34, No. 12, pp. 356-360. Montpellier, March 23, 1913.

The writer gives a detailed description of the method of imbedding whip-grafts in a hot chamber, which practice obtains more and more on all vine-farms where a sufficiently warm spring cannot be relied upon. According to this system, the grafts are put into open cases filled with a material as loose as possible and which can retain a certain amount of moisture; these cases are placed in a room with a temperature of 30° or 35° C. (86 to 95° F.) for the time required for them to bind properly. The substance generally used in the cases is a mixture of poplar sawdust and charcoal dust; the former retains the moisture and the latter allows the excess of water to drain off, while it hinders fermentation and the growth of moulds.

528 – **Reconstitution of the Vineyards in the South of France.** — MARÈS, E.: in *Le Progrès Agricole et Viticole*, Year 30, No. 10, pp. 295-299. Montpellier, March 9, 1913.

Seeing the present high price of vines, whether grafted or on their own roots, the writer advises for the reconstitution of vineyards, methods which, though now somewhat out of date, proved very satisfactory when applied by him to a vineyard of some 60 acres.

The first of these methods consists in planting cuttings in the open and in such numbers (4 800 per acre) that gaps can be replaced by the superfluous cuttings, and then proceeding to plant another area of the same size (placing the cuttings 5ft. 3in. apart each way, which will give 1600 per acre).

The second method consists of making a nursery, where the percentage of successful grafts is from 80 to 90; while the third consists of planting rooted stocks "in holes in winter" and grafting 5 or 6 months after.

529 - **Vine Growing in the Province of Mendoza, Argentina.** — RODRIGUEZ, FRANCISCO J. and LAFITTE, EMILIO: in *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 11-12. Buenos Aires, 1912.

The totals are here given, for the whole province of Mendoza, of some of a series of tables containing the data for every district of the province:

Cost of an acre of vineyard 3 years old.

When the work is done by contract	£ 83
When managed by the owner	£ 55

Extent of vineyards.

Vineyards planted with French vines	110 982 acres
Vineyards planted with native (criollo) vines	21 288 »

Irrigated area in the province of Mendoza in 1912.

Already irrigated	721 448 acres
To be eventually irrigated	732 884 »

Grape production of 1912.

	Quantity
White	15 123 627 lbs
Black	976 474 045 »
"Criolla"	100 647 533 »
	Value
Total	£4 245 850

Grapes exported in 1912:

White	140 755 lbs
Black	4 760 214 »
"Criolla"	3 776 870 »

Wine production of 1912:

	Quantity
White	1 027 211 gals
Red	69 273 826 »
"Criollo"	5 639 007 »
	Value
Total	£7 854 749

Chemicals used in the making of wine and their value.

Tartaric acid	2 233 594 lbs	worth	£153 872
Citric »	261 483 »	»	» 23 000
Tannin	51 188 »	»	» 5 097
Enophosphate	440 671 »	»	» 9 453
Metabisulphite	91 145 »	»	» 3 227
Clarifiers	9 938 »	»	» 226

530 – The Use of Chemical Manures for Fruit Trees. Results of Experiments made in 1909 and 1910 by the Royal Agricultural Station of Magyaróvár, Hungary.

– SURÁNYI, JÁNOS: in *Kísérletügyi Közlemények*, Vol. XVI, No. 1, pp. 61-73. Budapest, January-February 1913.

In 1909, the Royal Agricultural Experiment Station of Magyaróvár made experiments in different parts of Hungary on the use of chemical manures for fruit trees; the effect of the treatment was also noted in the following year.

The results obtained were as follows:

1) Under the continental type of climate prevailing in Hungary, the use of chemical manures increases the productivity of fruit trees. This is of especial importance for the trees on the vast sandy stretches of Hungary, where the poverty of the soil only allows a crop every other year.

2) Although the returns of one year show that the use of chemical manures is remunerative, it is impossible to determine the actual profit obtained till after at least two normal years.

3) This manuring not only increases the quantity, but also the quality of the fruit.

The following table shows the increase in the yield of 100 fruit trees obtained by the station in 1 and 2 years respectively:

	Districts	Apples	Pears	Plums	Apricots	Green-gages	Egriots	Quinces	Cherries
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
In 2 years	Baja	—	287	408	1 530	1 250	—	855	—
	Nagykörös	13 350	2 850	—	—	—	—	—	—
	Ermihályfalva	275	600	970	—	—	—	—	—
In 1 year	Fülöpszállás	1 450	8 800	3 300	5 850	—	5 850	—	8 800
	Alsóvály	1 250	—	—	—	—	—	—	—
	Perecsen	4 400	4 550	—	1 100	—	—	—	—
	Felsővály	7 575	14 900	730	—	—	—	—	—

531 – Data on the Cultivation of Citrus Fruit in the Province of Salerno, Italy.

— BRIGANTI, G.: in *l'Italia agricola, Giornale di Agricoltura*, Year 4, No. 6, pp. 152-153. Piacenza, March 30, 1913.

The citrus fruit plantations in the province of Salerno occupy an area of 4589 acres, without reckoning trees mixed with other crops. The yearly production of fruit is 492 000 cwt., of which 275 500 cwt. are oranges, 157 440 cwt. lemons, and 59 000 cwt. tangerines; the total value is about £198 000. The lemons grown along the coast of Amalfi are a forced cultivation; the preparation of the land costs from £320 to

£ 800 per acre. In the Nocera district the best citrus fruit groves are let at rents reaching to £ 32 per acre; they generally consist of oranges and tangerines planted in alternate rows (about 240 trees per acre), and they are often interplanted with walnuts (32 to 40 per acre). The harvest continues from December to August. The oranges most grown are the flattened orange (*Citrus Aurantium depressum* Risso), the pear-shaped orange (*C. A. ellipticum* Risso), the Maltese, and the blood orange. Almost all the lemons are exported to New York and to England; two thirds of the oranges and tangerines produced are consumed in Italy; the rest are exported, chiefly to Austria-Hungary. The price of tangerines ranges from 6 to 12 shillings per cwt., that of oranges from 2*s* 10*d* to 4*s* per cwt. from December to March and from 7*s* 3*d* or 8*s* to 12*s* and 16*s* per cwt. in summer.

532 – **Citrus Fruit Growing as a Commercial Industry in Southern Rhodesia** [1]. — FARMER, C. E.: in *The Rhodesia Agricultural Journal*, Vol. X, No. 3, pp. 358-361. Salisbury, Rhodesia, February 1913.

The writer of the above is adviser on citrus cultivation to the British South Africa Company; he gives a most encouraging account of the prospects of this new industry. Having had 18 years' experience in America, he considers that 5-year-old orange trees in Southern Rhodesia surpass 7-year-old trees in Florida both in size and in bearing capacity, notwithstanding the fact that the latter receive two dressings of fertilizers every year while the former remain unmanured.

533 – **The Peach in the South-East of France.** TSCHAEN, E.: in *Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 12, pp. 366-369. Paris, March 20, 1913.

On light and calcareous soils, the peach does well on its own roots; but when the soil is a clay and damp, it is grafted on the plum, and in the case of dry soils, on the almond.

The writer enumerates the varieties of peaches grown in the South: *a*) soft peaches: Amsden, Alexander, Halle Early, Earliest of All, Vainqueur; *b*) hard or Pavie peaches: Yellow Madeleine, White Pavie, Yellow Brunet Pavie, Yellow Saint-Michel Pavie. He then deals successively with the height and shape to be preferred for the trees, winter pruning, picking and yield, diseases and insect pests.

534 – **Bartlett Pear Precooling and Storage Investigations in the Rogue River Valley.** – STUBENRAUCH, A. V. and RAMSEY, H. J.: in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 114, pp. 19-24. Washington, February 1913.

As the result of a one season's experiment in Oregon, it was found that if picked when fully ripe, carefully handled, and cooled without delay, Bartlett pears may be stored for four weeks at the shipping point, and being subsequently sent in refrigerated cars to the Eastern markets will arrive in a sound marketable condition.

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[1] See also No. 269, *B*. March 1913. (*Ed.*).

535 – **The Reine-Claude Green Gage.** — RABATÉ, E.: in *Le progrès agricole et viticole*, Year 30, Nos. 10 and 12, pp. 311-315 and 365-378. Montpellier, March 9 and 23, 1913.

After a few words concerning the fruit and production of this plum tree, the writer deals at length with the method of pruning the Reine-Claude variety and concludes as follows:

While the shaping of the tree is a rather difficult and lengthy task, the further pruning is simple and easy and very favourable to the production of fine market fruit.

536 – **The Cultivation of the Japanese Medlar.** – OINOUE, J.: in *Revue Horticole*, Year 85, No. 5, pp. 106-107, 3 figs. Paris, March 1, 1913.

The Japanese medlar is a low tree, often hardly more than a shrub, with strong, thorny branches; in the wild state, it forms a pyramid. Its leaves are large, long and pubescent on the lower surface. This medlar grows well on nearly all soils, provided they are not completely arid. In Japan, it is usually grafted on quince or medlar, never on pear or *Crataegus Azarolus* (Neapolitan medlar). It needs a fairly hot climate, but its flowering it not usually hindered by early autumn frosts. The Japanese medlar is cultivated in the pyramid form, or simply as a bush, and is little susceptible to insect attack or disease.

At the present time medlar plantations of greater or less extent are met with in the provinces of Nagasaki, Iyo, Shizonoka, Osaka, Kanagawa and Chiba.

The chief varieties now grown are the following:

Gékkeikan. — Fruit very sweet and juicy, large, ovoid, yellowish-white in colour; it has four stones. The tree is very vigorous and productive; it grows in pyramid form, and is rather dwarf.

Mogi-Biwa. — Fruits generally five in a bunch, ovoid, a little more spherical than those of Tanaka-Biwa; orange-yellow in colour, very juicy and sweet. The tree is vigorous and fairly productive.

Téraoutchi-Biwa. — Fruit very large, round and of excellent quality, very sweet. There is usually only one stone, except in some fruits at the top or bottom of the bunch; the fruit is yellowish white and has a very pleasant flavour; it ripens very early. The tree is very vigorous and fertile, and is dwarf in habit.

Tamoura-Biwa. — Fruit fairly large, very sweet and juicy, and of a yellow colour. The tree is fairly vigorous and productive on calcareous soils.

Tanaka-Biwa. — Fruit very large, sweet and juicy, with few stones. The tree grows vigorously, but is not very prolific. This variety is the most prized and is much grown throughout the country.

Wasé-Biwa, or Early Bibasse. — Fruit small, very early, rather acid.

Wasé-ô-Biwa, or Large Early Bibasse. — Fruit large, very sweet, yellow in colour. Tree very prolific, much prized.

Sangatsu-Biwa, or March Bibasse. — This is the earliest variety and begins ripening in March. Fruit rather small, dark yellow. Tree very vigorous and prolific. This variety is adapted to the southern parts of Japan and of France, as well as to Italy and Spain.

537 – **The Condition of the Olive Groves in the Lepino-Pontine and Venafro (Campobasso) Zones.** – BRACCI, FL.: in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year XI, Series C, Parts 11 and 12, pp. 30-32 and 33-35. Rome, November and December 1912.

After having described the deplorable condition of the olive groves of these two districts, which have been left almost entirely without cultivation, the writer gives a detailed account of the cultural methods and parasite control necessary in order to keep olive trees in good bearing.

538 – **The Persian Walnut Industry of the United States.** – LAKE, E. R. — *U. S. Department of Agriculture, Bureau of Plant Industry*, No. 254, pp. 110. Washington, February 1913.

A complete survey of the walnut industry, including an account of the history and distribution of the crop as well as a descriptive list of varieties and full cultural details.

539 – **The Exportation of Fruit from Portugal between 1906 and 1910.** – *Boletim da Associação Central da Agricultura Portuguesa*, Second Series, Vol. II, No. 1, pp. 37-38. Lisbon, January 1913.

This bulletin contains statistics of the amount and value of the oranges, pineapples, apples, grapes, chestnuts and other fruits exported. The total value of these in 1910 was £186 312.

The Queluz School of Pomology, which is under the direction of the «Associação Central da Agricultura Portuguesa», as well as the Government Experiment Stations, have begun selecting those varieties which are most prized in the markets.

FORESTRY

540 – **The Forests of Bulgaria.** – WEISS, W. K.: in *Oesterreichische Forst und Jagd-Zeitung*, Year 31, No. 12, p. 106. Vienna, March 21, 1913.

The total area of the forests of Bulgaria is 7 515 418 acres, which are divided as follows:

State property	2 230 950	acres
Communal property	3 867 871	»
Private property	1 284 075	»
Property of institutions	132 522	»

The State forests are chiefly situated in the mountainous districts of the Stara Planina, Rhodope and Rila mountains and consist of 438 separate forests. The communal forest land lies more in the south and west of Bulgaria and includes 2966 forests. The private forests are scattered over small areas in the plain. The Bulgarian forests occupy about 30 per cent. of the total area of the country, but in the south of the country they amount to 60 or 65 per cent. There are about 2 ½ acres of forest per inhabitant; this proportion seems to be very satisfactory, but the smallness of the population must be taken into account.

With regard to the composition of these forests, deciduous species far outnumber conifers, and the following species are those which chiefly occur: above 500 m. (1600 ft.) oak and beech predominate; besides these there are ash, poplar, plane, elm and willow; conifers are represented by pines, firs and spruce.

Th vegetation can be divided into four zones;

1) A warm zone extending to 400 m. (1300 ft.) above sea-level. Here there were formerly vast forests, but much of the land is now devoted to agriculture; this zone has an east European vegetation.

2) A temperate zone, where the vegetation differs very little from the European flora, and some very large old trees still remain.

3) A zone reaching to 1300 m. (4300 ft.) above sea-level: besides conifers, beech is the prevailing tree; owing to its growing in places difficult of access, it is not readily turned to account; there are here beautiful stands of pure beech, or of beech mixed with ash and plane. The southern declivities of the Pila and Rodope mountains are clothed with pines; in the higher parts of the beech zone, spruce occurs.

4) Zone between 1300 and 2000 m. (4300 to 6500 ft.). This begins with beech mixed with spruce, the latter often forming thick stands; in the lower ground, grow firs, among which occurs *Pinus Peuce*, either in fine clumps, or as scattered individuals; above, at 1800 m. (5900 ft.) grows *Pinns Mughus* intermixed with spruce.

The ownership division from the point of view of altitude is shown by the following table, which gives the areas in acres.

	Up to 400 m.	400 to 1000 m.	1000 to 2000 m.
State property. . . .	732 797	858 821	638 841
Communal »	1 955 542	1 153 134	759 191
Private »	776 685	443 269	196 645
	3 465 024	2 455 224	1 594 677

As regards the height of the timber, the forest may be thus classified:

2 620 512 acres with trees of the average height obtaining in Europe;
4 894 414 acres with smaller trees, of which one quarter are conifers.

The annual increase of a large hardwood forest 100 years old and of good quality and normal density is 43.6 cub. ft. per acre, that of a slow growing wood of 20 years is 35 cub. ft. per acre of hardwood. The annual yield of coniferous high-forest 100 years old is about 81 cub. ft. per acre, while a slower growing 20 years'old conifer forest produces 59 cub. ft. per acre.

The total forest area of Bulgaria is estimated as worth £23 800 000. Bulgaria exports all kinds of hard and soft woods, both as raw material and in the form of manufactured articles. From 1898 to 1902, 29 730 tons of timber, to the value of about £47 784, were exported, while the imports during the same period reached 36 000 tons, worth £76 000. The imports have steadily declined, sinking from £140 443 in 1898 to £50 246 in 1902. The value of the exports, on the other hand, rose from £40 310 in 1898 to £61 996 in 1902.

Bulgaria chiefly imports soft wood and in the form of manufactured articles; during the above-mentioned period, 75 per cent, of the wood imported was of this kind, while 50.5 per cent. of the exported wood, was deal. Of late years, the wood industry af Bulgaria has increased, but formely only small articles of common use were made in household industry.

The timber of the State and communal forests is felled annually according to a plan drawn up by the ministry. The State either does the felling in its own and the communal forests, or else gives the work, by tender, to a contractor; often the right of felling is disposed of by agreement to large contractors.

Afforestation is done on the initiative of the State and carried out under the supervision of the latter. As the ground is rich in nutritive substances, the young trees soon make strong roots and grow well.

Regeneration in already existing forests is done by natural means and according to a system of periodical felling, which is settled by the ministry according to the requirements of the different species of trees.

The State employs 500 foresters in the care of its forests, and 2135 are entrusted with those belonging to the communes; this amounts to one forest guardian for every 4 461 acres of State forest and one for every 1 814 acres of the communal woods.

In spite of all regulations to the contrary, the peasants, as a rule, still allow their cattle to graze where they like, without the least consideration for the young plantations. The writer considers that if systematic and energetic measures were adopted, the time would yet come, when the forests would play a part of considerable importance in the State Budget, and the capital invested would bring in a satisfactory return.

LIVE STOCK AND BREEDING.

HYGIENE

541 - **An Enquiry made in 1912 to Determine the Causes, Frequency and Gravity of Rickets in Foals in West Flanders: the Measures to be Taken to Hinder the Spread of the Disease.** — ZWAENEPOEL in *Annales de Médecine Vétérinaire*, Year 62, No. 2, pp. 69-87; No. 3, pp. 120-151. Ixelles-Bruxelles, February and March 1913.

Compiled from observations made on the subject by 23 horse-breeders.

542 - **The Disinfection of Hides and Skins Containing Anthrax Spores.** - JEBB: in *Deutsche Schlacht- und Viehhof - Zeitung*, Year 13, No. 7, pp. 97-98. Berlin, February 1913.

Schattenfroh recommends common salt and hydrochloric acid for the destruction of anthrax spores. Another method worked out by Seymour-Jones consist in placing the hides for a long time in a mixture of formic acid and corrosive sublimate. Moegle (Stuttgart) set himself the task of testing the methods of both investigators and, at the same time, he tried to substitute formalin for corrosive sublimate in Seymour-Jones' method. Zeeb describes his experiments in the above article.

543 - **Piroplasmosis in Sheep.** — VON BÁTZ, STEFAN: in *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 68, Part 2, pp. 194-200. Jena March 1, 1913.

The writer's researches have proved that the sheep disease caused by *Piroplasma ovis*, which occurs in Rumania, Bulgaria and Turkey, as well as in Italy, Dalmatia and France, also exists in Hungary.

Detailed investigations have shown that the disease can assume an acute and a chronic form.

ANATOMY AND PHYSIOLOGY

544 - **The Passage of Products of the Digestion of Albuminoids from the Mother to the Foetus.** - BUGLIA: in *Biochemische Zeitschrift*, Vol. 48, Part 5, pp. 362-372. Berlin, February 11, 1913.

The above-mentioned investigations into the passage of non-albuminous nitrogen through the placenta were carried out at the Physiological Institute of the University of Naples. The writer injected into the *vena femoralis* of four bitches, far advanced in pregnancy, artificial products of the breaking up of albumen, which no longer possessed any albuminous properties, and then sought to discover these products in the blood of the foetus.

The injections were performed with extreme slowness, and with relatively large quantities.

After the injections were concluded, the body of the bitch was opened, the large vessels were ligatured, and the still living foetus taken out and beheaded.

The blood from the blood vessels of the neck was allowed to coagulate of its own accord, and then examined for albuminous and non-albuminous nitrogen. Before and after injection the albuminous and non-albuminous nitrogen content of the bitches' blood was determined. In some cases; the writer also examined the urine of the bitch, as well as the amnion and allantoid liquids.

For a comparison the blood of foeti and their mothers, which had received no injections, or only common salt injections, was afterwards examined as to its albuminous content. From a comparison of the results of the experiments, it was clearly proved that a portion of the non-albuminous nitrogen injected into the mother's blood had found its way into that of the foetus.

FEEDS AND FEEDING

545 - **Utilization of Food by Zebus.** - PUCCI, C.: in *l'Agricoltura Coloniale*, Year VII, No. 1, pp. 11-28 + 2 figs., Florence, January 1913.

The writer, Director of the Stock Breeding Laboratory of the Royal Superior Institute of Experimental Agriculture at Perugia, having under his charge a young zebu bull of about two years of age and belonging to the Gujerat breed, which was completely accustomed to its new surroundings, set himself the task of observing the power of these

Indian cattle for digesting various food stuffs in comparison with the capability shown by European breeds in this respect.

As a control was selected a young Podolian bull 20 months old from Todi, the result of a cross between the Val di Chiana (Umbrian variety) and the Maremma breeds.

At the time of the experiment, the weight of both animals was the same.

The experiments were divided into two series: in the first, the animals were fed on average quality meadow hay; in the second, on hay and earthnut cake.

Both animals were kept in the same shed and their dung and urine were collected with particular care.

After having ascertained the amount of food consumed by the two bulls, each was assigned a similar ration, according to its requirements.

The forage was examined first and subsequently the dung and urine.

The results of the first series of experiments proved that the two subjects showed no special difference in their power of absorbing various substances, with the exception of fat, of which the zebu absorbed a greater proportion.

Nevertheless, the latter animal showed a slight difference in favour of nitrogen, while the former absorbed more nitrogen-free extract and mineral substances.

Both bulls evinced a gain in nitrogen; this was, however, more noteworthy in the case of the Todi animal, since the zebu consumed more of this substance.

In the second series, with meadow hay and earthnut cake, the zebu absorbed more nitrogen, fats, nitrogen-free extract and mineral substances than did the other bull, which showed a slightly higher capacity for the absorption of cellulose. Further, the zebu show a considerably larger gain in nitrogen than the other animal.

Both bulls, on receiving more concentrated rations, increased in their absorption of almost all the nutritive principles, but the zebu did this to the larger extent. This proves its greater aptitude to digest and assimilate nitrogenous matters, fats, nitrogen-free extract and mineral substances. This agrees with the two animals' increase in weight and the proportion of nitrogen acquired by them during the experiment.

It is well to mention in conclusion that the two bulls drank different amounts; the zebu always required less water, which according to the writer, points to its being adapted to living in hot climates subject to periods of drought.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

546 - **The Drawing Up and Printing of Pedigrees.** — WILSDORF: in *Merkblatt der Deutschen Gesellschaft für Züchtungskunde*, and in *Zeitschrift für Gestütkunde und Pferdezucht*, Year 8, Part 3, pp. 63-67. Hannover, March 1913.

A glance at the more recent literature dealing with the subject of animal breeding shows that the pedigrees are drawn up and printed in different ways, which greatly increases the difficulty in tracing lines of ancestry.

The writer suggests that pedigree tables should be drawn up uniformly in the manner adopted by the " Institut für Zuchtstudien " and the " Deutschen Gesellschaft für Züchtingskunde " in the publications dealing with animal breeding.

The form suggested by the writer, is given on page 779 on a somewhat smaller scale, on which is shown the pedigree of " Undine." The following points should be noticed in drawing up and in using these pedigree tables:

1) Pedigree tables must be symmetrical in all their parts.

2) The normal-sized form (1) for manuscript entries is 7.3×4.6 in. A thick black line should enclose the table, which should be divided in the centre by a thick horizontal line drawn from the line marking off the first division (i. e. from left to right). In the case of short pedigrees, forms of half or a quarter the size are sufficient.

3) The list of ancestors should always be printed with the narrow side up; the descendant (Undine 8348) on the left in the first longitudinal division.

4) The father of the offspring is entered in the upper half of the second longitudinal division, the mother in the lower half, and the grandparents are then entered in the 4 compartments of the third longitudinal division.

5) In the first three narrow divisions (on the left) the names and number must be written in a perpendicular direction; but horizontally in the three following divisions; the names in the latter divisions should be written immediately before the line separating off the small divisions on the right.

6) In the 1st, 2nd and 3rd longitudinal divisions, the names are to be written in each compartment, in such a manner that the dividing line, which cuts the right edge of the table, reaches the centre of the name with the number.

7) The numbers are placed, without the letters " No.", exactly after the names in divisions 4 and 5; in the case of longer names, the number can come immediately below the latter.

8) In the 6th longitudinal division, the parents of the animals therein entered are frequently given, in which case it is necessary that the name of the father shonld be written above that of the mother in the right half of the division; a more distant progenitor can be entered

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(1) To be obtained from the Geschäftsstelle der Deutschen Gesellschaft für Züchtungskunde, Berlin-Halensee, Halberstadtstr. 3.

on the right; thus in the 6th division of the accompanying pedigree table belonging to "Undine," beside Olga 1 are given the names of her parents, Matador 589 and Olga 4817 and, further, their father Primus 91 is also clearly entered.

If the names are written small, there is room in the division for several generations of ancestors.

9) Wherever the name of an ancestor is missing, a short horizontal stroke should be made in the right place in the written table, (see in the cases of Robert and Hulda). In printing, these strokes may be omitted. They should only be used when it is certain that the ancestors are unknown.

10) Should more distant ancestors, or other important relationships or combinations be known in the case of the animals figuring in division 6, which it is impossible or undesirable to enter, the sign 〰 should be entered behind the name of the animal in the manuscript pedigree. (See Primus 91 next to Olga).

11) Entries in the pedigree tables must be written legibly.

12) The reading of manuscript pedigrees is greatly facilitated if the names to not adjoin the lines. In the sixth longitudinal division, sufficient space should be left (about 5 mm) to allow of the insertion of figures if necessary.

13) In the longitudinal divisions 4 and 5, the initials of names of equal length should come directly under one another, and this arrangement should be observed in the case of all the initials in division 6.

14) The names of animals which occur many times in a pedigree can be represented by filled or unfilled signs; these must be placed behind the numbers of the animals in divisions 2 and 4, above the centre of the name in divisions 3 and 5, and before the names in division 6. Large signs are used for the nearest ancestors and smaller for the more distant concestors, which are entered further to the right. Animals which are related, but have a somewhat different line of descent, are represented by unfilled signs, in which the amount of "blood" which they have in common with their mate, can be expressed by a fraction. (1)

15) The compositor must use exactly the same signs as those given in the written pedigree. Larger and smaller signs of the same kind must only be used for the same animals, or related ancestors.

16) In manuscript pedigrees, the signs which denote ancestors, or relatives on both the father's and mother's sides, should be written with black ink (e. g. Matador); signs which only represent ancestry on the one side should be red (e. g. Elso 2011); those which only represent a quarter or an eighth of common ancestry are coloured green (Sturm 1213).

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(1) Example: Enzian 4237 has ½ the blood of Gregor 2358 and ½ that of Eichr 1811, or he has 1/4 of the blood of Elmar 1656, Gesine 6404, Matador 589 and Einhorn; of these animals, only Gesine 6404 does not appear in the pedigree of Editha 1817; Enzian 4237 has therefore 3/4 of the same blood as the last-mentioned animal.

Undine 8348	Elso II 34	Elso 2011 □ 3/4 (red)	Oskar 1535	Robert 1325	▬ Matador 589	— —
					—	
				Hulda 7829	—	
					—	
			Else 6448	Bernhard 778	—	
					—	
				Elvira 5042	Ajax 428	— —
					Lottchen 2415	Falk 71 — Lotte 783 —
		Sarah 4688	□ 3/4 (red) Eginhard 2072	Oskar 1553	Robert 1325	▬ Matador 589 —
					Hulda 7829	— —
				Eleonora 5392	Bernhard	— —
					Emma 3508	— Eva 3091
			Stadtwyk 9274	Heinrich 1386	Roland 1088 ▬ ✝	Matador 589 — Alma 2588 —
					Olga I ▬	Matador 589 Olga 4817 •Pr 91 ∿
				Stadtwyk 2395	—	
					—	
	Walküre 7819	Caesar 1710	○ 3/4 (green) Sturm 4681	Wodan 825	Ajax 536	— —
					Pauline 2843	— —
				Enka 4731	✱ Primus 91	— Diana 979
					✝ Alma 2588	
			○ 3/4 (green) Agathe 5681	Wodan 825	Ajax 536	— —
					Pauline 2843	— —
				Clara 3170	✱ Primus 91	— Diana 979
					Hertha 986	— —
		Edelweiss 6905	▷ 3/4 (green) Enzian 4237	Gregor 2358	Elmar 1656	— —
					Gesine 6404	— —
				Eiche 1811	▬ Matador 589	— —
					Einhorn	— —
			▷ 7/8 (green) Editha 1817	Elmar 1654	—	
					—	
				Elfriede 7495	son of	▬ Matador —
					Einhorn	— —

17) The compositor may abbreviate long names in division 6, but no other alterations are admissible. Abbreviations can only be used where the names have occurred in full in earlier divisions of the table. Should the space in division 6 be insufficient for the names and numbers and signs of further ancestors, the signs alone are entered. Explanations of the pedigree, breeding information and premiums should be entered on the back of the form. But in the 1st longitudinal division (allowing a suitable interval) the name of the breed can be entered below (on the right) and the date of birth (above) on the left.

547 - **Live Stock Breeding in the Sierra do Norte in Peru.** — BROGGI, ALFREDO: in *La Riqueza Agricola*, Vol. II, No. 13, pp. 867-873. Lima, January 1913.

On account of the distance of the Sierra do Norte from populous centres and of the lack of roads, stock breeding in this region is still practised on primitive lines. The estates are very extensive — up to 25 000 and 50 000 acres; sometimes the same owner possesses adjoining estates reaching from the coast to the mountains.

The estates are divided into "campos," "potreros" and "inviernas." The "campos," which occupy the greater area, are not enclosed and they are grazed during the rainy season. The "potreros ,, include the best pastures and are mostly surrounded by dead hedges or by ditches. They are reserved for the use of weak and young animals during the dry months; the "inviernas" are irrigated meadows often enclosed by dry stone walls and sown to "paja chilena" or "paja parada" (*Stipa* spp.) and devoted to the fattening of the cattle to be sold during the year. Sometimes the "potreros" also are sown with "paja chilena," or settlers are allowed to grow cereals in them on condition of leaving the stubble for forage.

The "inviernas" are sown by hand, a pick being used to prepare the soil which is too irregular and too stony to be ploughed. The ground is resown every 10 to 15 years.

It is customary to give any agriculturist who settles on the estate, as farmer, a certain extent of land, on payment of a trifling rent (1 to 10 soles that is 2 to 20 shillings) and of a share of the produce (beans and maize); the farmer has also to assist in the performance of certain work, his share amounting in all to 30 days per annum, and to pay 1 sol (about 2 shillings) for grazing rights per head of cattle per year. Strangers pay twice as much. This promiscuity is often injurious to the cattle of the estate, which gets crossed with inferior animals.

Once a year, at the approach of the rainy season, a general inventory is made of the live stock, taking the herds — that is the cattle entrusted to one herdsman — in succession. It is then that the animals are branded and eventually castrated. In some estates the cattle are rounded up a second time at the end of summer, when the animals to be fattened are picked out. Where horses and cattle are bred the inventories are made separately.

It takes from 3 to 6 months to fatten cattle in the "inviernas."

The cattle of the Sierra is smaller and not so well built as that of the coast, where selection and crossing with improved breeds is practised. Nevertheless, even in the Sierra do Norte, a breeder has introduced excellent Hereford bulls.

The chief and most profitable industry is the fattening of cattle, though some cheese is made. The cows are milked only during two or three months in the year and they yield barely a quart of milk per day. Both cheese and butter are made very imperfectly and with the most rudimentary utensils.

A good deal could be done for the improvement of breeding in the Sierra do Norte. The climate is mild, the temperature rarely sinking below 1° C. and the rains are abundant in the summer; consequently, with a relatively small amount of labour, plenty of pasture might be secured all the year round. There are no cattle diseases. The liver-fluke is the parasite most to be feared.

Sheep breeding would find favourable conditions, especially in the "puna" or higher part af the Sierra, but it is not so profitable as cattle raising. Some years ago Merinos were introduced, but as no proper care was bestowed on the crossing, the flocks soon degenerated, and now they have not much more wool than the native (criollo) breed. The death rate is rather high, chiefly owing to staggers, so that often the yearly increase is not above 10 per cent. There are also many ticks. The average yield of washed wool per head is from ½ to 1 lb. per head. It sells at 8 to 10 soles per arrota (7½*d* to 9½*d* per lb.) The average price of sheep is about 4*s* and of fat sheep about 6*s*.

548 – **The Fat Stock at the General Stock Show in Paris.** — VOITELLIER: in *La Vie Agricole et Rurale*, Year 2, No. 14, pp. 381-384. Paris, March. 8, 1913.

This report gives advice as to fattening and exhibiting stock, as well as information respecting the success obtained with various French breeds of cattle, sheep and pigs.

HORSES, ASSES AND MULES

549 – **The Prussian Half-Bred Horse.** — GANZERT: Unser Halbblut. — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 20, p. 183. Berlin, March 8,1913.

The writer mentions the criticisms, which are often passed upon the East Prussian horse and shows how its early maturity may be turned to account without detriment to its excellent qualities.

550 – **East Prussian Studs [and the Supply of Horses for the Army.** — GOLDBECK: in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 24, pp. 224-225, Berlin, March 22, 1913.

Information respecting the development of the East Prussian remount studs and the present breeding of remounts, together with an account of the importance of this work for the army. The last section gives a list of the best private studs.

CATTLE

551 - **The Austrian Cattle Census of December 31, 1910, and the Fluctuations in the Number of Cattle since 1900, especially as regards Milch Cows.** LEDERER: in *Österreichische Molkerei-Zeitung*, Year 20, No. 5, pp. 65-66. Vienna, March 1, 1913.

In 1910, the total number of cattle in Austria amounted to 9 160 009; of these 4 901 856 were cows and 1 154 283 steers. In comparison with the 1890 cattle census returns, there is a decrease of 3.7 per cent. This falling off is chiefly in steers (20.7 per cent.) and bulls (16.5 per cent), for the cows have increased 3.3 per cent., owing, in the writer's opinion to the increase of dairy-farming. The number of cows has risen from 50 per cent. to 53 per cent. of the total horned stock, but this increase has not kept pace with the growth in population. While in 1900, there were 181.5 cows per 1000 inhabitants, this number had fallen to 171.6 at the time of the last census.

The number of cows has decreased every where in the Alps, except in Lower Austria. This is especially noticeable in Carinthia (7.1 per cent.), in Carniola (6,8 per cent.), and in the Voralberg (6.8 per cent.).

In the Sudeten and Carpathian districts a considerable increase is to be observed: 7.8 per cent in Moravia, 5.8 per cent. in Galicia and 9.2 per cent, in the Bukowina. In Salzburg, there are 329 cows per 1000 inhabitants (the maximum), in Upper Austria 323, in Carinthia 229.9, in the Tyrol 229.5 and in the Vorarlberg 226.8. while in Dalmatia the number sinks to 45.5 (minimum).

Rearing young cattle seems to be most extensively practised in Styria, Carniola, Göritz, Gradiska, Bohemia, Moravia, Silesia, Galicia and the Bukowina.

552 - **A Contribution to the Knowledge of Tarantais Cattle from the Zootechnical and Economic Standpoints.** - HOFFMANN: in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part. 3, pp. 309-337. Vienna, January 15, 1913.

The detailed investigations of the writer led to the conclusion that Tarantais cattle (" Race tarantaise," or " Race tarine ") of south-east France are not, as Boncher supposed, the result of a cross between the " Race Jurassique " (Swiss spotted cattle) and the " Race des Alpes ", but a separate pure breed. In order to determine the descent and relationships of these cattle, the writer made comparative examinations of their skulls, of which the results justified the conclusion that the Tarant cow is a direct descendent of the old lake-dwellers' cattle, which were once found everywhere throughout Savoy. Some primitive characters of the lake-dwellers' cattle seem to be still latent in the Tarantais. The structure of all the skulls examined showed a considerable improvement upon the type belonging to the pre-historic breed. The writer especially noticed a shortening of the face and a corresponding broadening of the forehead and back of the head, from which he came to the conclusion that this short-horned breed was not only more highly developed, but that its development had proceded along brachycephalic lines. This small amount of brachicephaly is not, in his opinion, to be attributed to a mixture of breeds.

Therefore the Tarantais cattle should be placed in the zootechnical system between the third and fourth forms of the type " *Bos taurus europaeus.* " Dr. Hoffmann gives a detailed account of the Tarantais breed, which has hitherto been little dealt with in books on cattle.

553 – **The First Show of the Red Cattle of Central Germany at Biedenkopf.** — KEISER: in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 12, pp. 135-136; No. 13, pp. 150-151. Berlin, February 8 and 12, 1913.

This is a report of the first exhibition of breeding cattle, which was held by the Federation of Breeders of the Red Cattle of Central Germany at Biedenkopf last autumn. To this Federation, which was founded about eighteen months ago, there are now affiliated 22 Breed Associations with about 10 000 head of cattle. Its object is the improvement, by means of selection, of the breeding stock of the native red cattle, which are kept in the mountainous districts of Central Germany and in Silesia. The aim of the Federation is to obtain an animal good for milk and meat production and also for work, and which is better adapted to the needs and economic capacity of the different breeding districts.

An attempt is being made to unite higher milk yield, greater weight, a better formed hind quarter, a more powerful muscular development of the thighs, as well as earlier maturity, preserving at the same time its special aptitude to draught purposes. The live-weight of three-year-old bulls should be from 1320-1980 lbs. and that of five-year-old cows from 880-1540 lbs. The head and neck should be moderately long and strongly attached, the fore quarter and chest deep and wide, the shoulder long and sloping, and the back straight. A broad rump, long pelvis, regularly formed udder, clean powerful limbs with short pastern, and hard hoofs are also required of the typical red cow of Central Germany.

The proof that the Federation is not aiming at impossibilities has been given, according to the writer, by this first show, where a considerable number of animals were exhibited, which have nearly attained the breeder's aim. The report contains pictures of many of the breeding cattle shown.

554 – **The Slaughter of Cows in Calf and its Influence on Beef Production.** – BUCHEM: in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 13, pp. 149-150; No. 14 pp. 159-160. Berlin, February 12 and 15, 1913.

In 1910, Dr. Buchem drew up statistics of the number of in-calf cows slaughtered in the Cologne slaughter-house. He extended his investigations to the weight of the uterus, as well as to the weight and age of the foetus. The statistics showd that 16.5 per cent. of the cows were in calf, and most of them were not over four years old. With advancing age, the writer found a decrease in the number of cows in calf slaughtered. The number of cows in calf slaughtered was larger in October and smallest in June The annual average was exceeded in September, November. December and January, from February onwards the number fell below the average; and from July, it again rose noticeably. The pregnancy was usually of 3 or 4 months' duration, least often as much as 8 or 9 months.

The weight of the uterus with the foetus was, in the case of 3 or 4 months' pregnancy, 9 to 15 lbs. The uterus of cows not in calf averaged 2½ lbs. The extra weight of the uteri due to pregnancy was 33.000 lbs. The total number of foeti weighed 11 850 lbs. If these results be applied to the whole country, as may reasonably be done, seeing that similar or the same percentages have been obtained in many other slaughter houses, it follows that 298 546 cows in calf are annually slaughtered in Germany; consequently over 1000 tons of meat are lost by the destruction of the foeti. The writer considers that German farmers would be able to produce and supply all the meat required by the population, if fewer pregnant cows were slaughtered.

In order to attain this end, Dr. Buchem recommends the declaration of the meat of pregnant animals and the legal application of breach of warranty to cases of the sale of cows in an advanced state of gestation.

555 – Influence of Alpine Grazing and Weather on the Milk-Yield of Cows. –

ULMANSKY: Über den Einfluss der Alpung und der meteorologischen Faktoren auf die wirtschaftlichen Leistungen von 27 Kühen der Anstaltsherde in Rotholz, Tirol. *Mitteilungen der Landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 3, pp. 339-391. Vienna, January 15, 1913.

During the summers of 1910 and 1911, the writer made fortnightly test milkings and determinations of the fat content of the milk of 27 cows at the Rotholz Provincial Agricultural Institute in the Tyrol. At the same time, the meteorological conditions were closely observed, in order to determine whether they had any influence upon the cows' performance.

The animals belonged to the grey-brown mountain breed and spent the greater part of the summers in question on an Alpine meadow, only 6 cows remaining in the valley. All the cows were weighed at the beginning and end of the grazing period, and the weight of their calves at birth was ascertained.

From the tables and diagrams giving the milk yield and fat content and also the different meteorological factors (temperature, atmospheric pressure, precipitation, etc.), practically no regular influence of the latter upon the amount of milk or the fat content of the milk can be determined. Snow was the only factor which reduced the milk yield.

The cows which had grazed on the alp gave a little less milk than those which had been kept on the valley pastures, but the fat content of their milk was slightly higher.

556 – The Variations in the Composition and Properties of the Milk from the Individual Cow. –

ECKLES, C. H., and SHAW, ROSCOE H. *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 157. Washington, 1913.

The writers investigated the milk of 7 cows of different ages and breeds during about a fortnight (sometimes also for a shorter period), in order to ascertain the composition of the milk and the variations in the protein, sugar and fat content, as shown by the Reichert-Meissl, iodine, and saponification values and the melting points. The details are given in tables.

557 – **The Milking Tests of Tyrolese Cattle-Breeding Associations.** KUBRAT: in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 24, pp. 292-293. Vienna, March 22, 1913.

This article gives the data collected during a period of five years, and referring to the different breeds of cattle kept in the Tyrol.

558 – **The Moscow Sheep Breeders' Congress and Exhibition.** – TELSCHOW: in *Zeitschrift für Schafzucht*, Part 3, pp. 49-57. Hannover, March 1913.

SHEEP

In October 1912, a Sheep-breeding Congress for the promotion of this industry in Russia was held at Moscow in connection with an exhibition of sheep, which included a scientific section and one devoted to demonstrations connected with the wool industry. During the sittings of the Congress, at which the writer was present, much stress was laid on the fact that Russia did not require any more to import sheep, or in any case only to a limited extent.

There are, at the present time, 87 million sheep in the country; these may be divided into two categories, producing fine and coarse wool respectively.

Of the first type there are 6 millions, including different breeds of Merinos. The other 81 millions consist of short-tailed, fat-rumped, broad-tailed and long-tailed sheep, of which the last are bred for meat, milk and fat and also for their fur. From the information supplied to the Congress, it appeared that sheep-breeding had only declined in the districts where pure bred Merinos were kept. The proportion of sheep to the population varies in different districts: in some there are 30 sheep per inhabitant; in others 200, this very high figure occurs in places remote from centres of communication, and it was part of the work of the Congress to open up such districts.

The Russian Merino sheep, to which the writer devoted special attention, is a typical exclusively wool-producing animal. As flocks of Merinos only occur isolated in Germany and the German breeder's aim is totally different from that of the Russian farmer, there is no question of importing Merinos into Russia from Germany.

English breeds and their crosses have not proved very successful in Russia, so that breeders in that country have to resort, more or less, to the systematic improvement of the numerous native breeds of sheep.

Of the many breeds exhibited, the writer decribes the Kurdjuck and Wallachian breeds.

The large Kurdjuck sheep; is a native of South Russia, and belongs to the fat-rumped type; it is reared for meat and fat only, as its fur is poor, but it is resistant and thrifty. It reaches its full size at the age of 6 months. The measurements taken by the writer of an adult ram were as follows: height at withers 35 inches, breadth of chest 9 in., depth of chest 15.3 in., total length, without cushion of fat, 3 ft 0.6 in., with fat cushion, 3ft 4.5 in., the latter can weigh up to 33 lbs.

M. Telschow opines that this breed would also be profitable in Germany, especially if crossed with the native breeds, and would thrive in heath districts, where the food conditions are very variable. These sheep are also suitable for crossing with the South-West African fat-tailed breed.

Many crosses have been successfully made in Russia, especially with Merinos.

Wallachian sheep are chiefly bred for their fur, and in addition to producing the valuable Pollschu ram fur, they also furnish a good deal of meat. The writer is of opinion, that these sheep might be kept with advantage also in Germany, and after giving a short account of the many exhibits dealing with sheep breeding, which were shown in the Wool Industry Section, he expresses the hope that one day, on the occasion of such a Sheep Exhibition, an International Sheep Breeder's Congress may also be held in Germany.

PIGS

559 – The Improvement of the "Mangalicza" Breed of Pigs in Hungary. –

KOVÁCSY, BÉLA, in *Mezögazdasági Szemle*, Year XXXI, No. 3, pp. 172-173. Budapest, March 1913.

This breed is much prized in Hungary for its fat-producing qualities and its adaptation to the conditions of climate, soil, and food obtaining in that country.

It has, however, the serious defects of not being sufficiently prolific or early maturing and to these causes must be attributed the exhaustion of the Mangalicza breed. It was therefore necessary to cross it with another stock, which without altering the qualities which render these pigs indispensable to Hungary, would at the same time increase their prolificacy and accelerate their growth. The necessary qualities have been found in the Lincolnshire breed; this was introduced for the first time and exhibited at a Show of breeding stock held in Hungary two years ago.

Of the various English breeds of pigs, the Lincolnshire is the one which fattens best, and most resembles the Mangalicza in its shape and curly, white hair. Further, the crossing experiments made during this short time already showed that the cross-breds of the first generation fulfilled the wishes of the breeders in every respect; the animals developed more quickly and were more prolific without in any way losing their property of easy fattening. On the contrary, with the same food, they attained a heavier weight than pure-bred Mangalicza pigs.

Many Hungarian breeders, encouraged by these results, began to turn their attention to Mangalicza-Lincolnshire crosses. The following information has been given by two breeders respecting Mangalicza crosses:

At Balatonföldvár, M. Márkus kept pure bred Mangalicza and Mangalicza × Lincolnshire pigs in the same herd and on the same rations.

The average weight of the pure bred young pigs when 8 ½ months old was 119 lbs., while that of the Mangalicza × Lincolnshire pigs of the same age was 165 lbs.; the hybrids thus weighed 46 lbs. more than the others, which represents a difference in value of 17*s*. 5*d*. per head. The breeder considers that, when the pigs are one year old, the difference in their weight will amount to from 77 to 79 lbs. per head in favour of the improved Hungarian breed.

At Kajdacs, M. Blascsok selected 328 young cross-breds, of which the weight, at the age of 6 weeks, was from 35 lbs. to 55 lbs. Their weight at 6 months was 132 lbs.; they were used for breeding purposes at the age of 11 to 12 months. The castrated pigs weighed 550 lbs. per pair, at 14 months, and gained 392 lbs. in 4 months, while pure-bred Mangalicza animals only weighed 484 lbs. per pair when 2 years old, and only gained 345 lbs. during the same time and with the same rations.

On the writer's farm, cross-bred pigs weighed from 220 to 264 lbs. the pair at the age of 6 ½ months and from 282 to 330 lbs. when 7 ½ months old.

It is very difficult to acclimatize the pure-bred Lincolnshire in Hungary, especially when it is first imported ; many animals have to be rejected ; but after the first year, they often prove excellent breeders.

The sows are very prolific and rear their young very well ; the latter develop rapidly.

560 – **A Contribution to the Knowledge of the Length of Pregnancy in Goats.** — MACHENS : in *Berliner Tierarztliche Wochenschrift* Year 29, No. 10, pp.187-189. Berlin, March 6, 1913.

GOATS

144 animals were the subjects of these investigations. Some of the goats belonged to the Harz breed, others were crosses between native goats and Harz, Saanen, and Toggenburg animals. The length of the period of pregnancy, which varied with the age of the goats, was from 142 to 164 days, from which fact the writer draws the conclusion that the variations hitherto allowed for were too slight.

FARM ENGINEERING.

561 – **Trial of Bone-Mills.** — KEISER : *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 237. Berlin, 1913.

AGRICULTURAL MACHINERY AND IMPLEMENTS

The competition held by the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft) on July 7 and 8, 1912, in the Central Poultry-breeding Establishment of the Chamber of Agriculture for the Province of Saxony has shown that decided progress has been made since the competition held in 1909.

The object of these bone mills is to reduce bones, both raw and steamed or boiled, to a form suitable to be used as food for animals (poultry, pigs, etc).

Four hand machines and two power driven machines were tested. The tests were conducted as follows: firstly half a pound of bones of different kinds were given to each machine and the time each took to grind them was noted Then a dynamometer was connected with the machines and observations were made as to the quantity of the same material that could be ground in two minutes. Further the commission ascertained the performance per hour, the amount of power required, and examined the quality of the meal produced.

The above tests yielded the following results:

A. HAND MACHINES.

No. 1. Hand bone-mill with fly-wheel: D. R. P. (1) No. 242 002. — This mill grinds per hour 20 to 22 lbs of boiled bones, 11 to 13 lbs. of raw bones or 6 ½ to 9 lbs. of hard limb-bones. Its price is 28*s* 8*d*. The opinion of the judges was as follows: Provided the device for fixing the mill be improved, machine No. 1 may be declared specially suitable to small concerns, as it yields a very good meal free from splinters and is also very cheap.

No. 2. Bone-mill with crank: D. R. P. No. 242 002. — The output is about 11 lbs. per hour. The price of the machine is 24*s* 6*d*. The judges' verdict was the following: This machine turns out a meal somewhat inferior to that produced by machine No. 1, but still fairly good. Its output is also less and it is not so easy to work and to clean. On the other hand, thanks to an ingenious device, it can easily be fastened to tables projecting but little over their frames. Considering the very slight difference in price, machine No. 1 is decidedly to be preferred.

No. 3. Bone and Universal Mill " Heureka" (Moh's system), B. Model worked by land: D. R. P. No. 217 638. — It grinds from 4 ½ to 11 lbs. per hour. The price of the mill is 24*s* 6*d*. The judges' opinion was the following: Machine No. 3 gives, especially with household bones, a good meal. It is easy and safe to work, and relatively cheap.

No. 4. Bone and Universal Mill " Heureka " (Mohs' system), E. Model with fly wheel, worked by hand: D. R. P. No. 217 638. — Its output is stated to be 8.8 to 26.2 lbs. per hour. Power required: one man. Price £4 3*s* 3*d*. The judges' opinion was the following: The mill turns out, especially with household bones in a short time a good quantity of excellent meal, but when working to its full capacity it is too tiring for a man of normal strength. It is besides too dear.

B. POWER DRIVEN MACHINES.

No. 5. Bone and Universal Mill " Heureka," Z. Model: D. R. P. No. 217 638. — The output is said to be 66 to 77 lbs. of coarse meal per hour. The power required to drive it is indicated at 1 H. P. The price is £14 14*s*. In the opinion of the judges the machine as it is at present is not to be recommended owing to the danger attendant on its use and to the splintery nature of the meal produced from household bones and ribs.

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(1) Deutsches Reichs Patent. (*Ed.*).

No. 6. *Bone Mill No.* 8. — The machine is stated to grind 110 lbs. of bones per hour. The power required is indicated to be 2 H. P., and the price £12 5*s*. The judges consider it to answer all just demands upon it. The mill produces per hour a good quantity of excellent meal from all kinds of bones, and it if were somewhat cheaper it could be still more highly recommended.

562 - Abstracts of recently published Patent Specifications. (England).

21483. *Swede and Turnip Harvesting Machine.* (September 29, 1911).

This invention relates to a machine for harvesting swedes, turnips, mangel wurzels, beetroots, etc. It comprises a floating cutting device, to sever the tops, arranged at the front of the machine and adapted to be moved up and down to suit the height of the root tops, a tailing device consisting of a transversing horizontal blade which passes under the root and severs the tail, leaving the same in the ground, an elevator behind the tailer, and a cleaner into which the roots are delivered by the elevator.

12058. *Grain or Seed Drilling Machine.* (May 21, 1912).

This invention relates to improvements in a grain or seed-drilling machine, and consists in providing it with two sets of sowing funnels and two sets of coulters so connected that, according to the direction of movement of the machine, one or other of these sets can be brought into position for service. The drill may be worked either by animal or motor-power. In the former case if it be desired to reverse the motion of the machine the animal must be harnessed at the other end of the machine, but in the latter case to obtain the change in direction required it is only necessary to reverse the motor or to reverse a gear which is mounted in a suitable place on the carriage frame.

27529. *Machine for Sowing Mangold, Turnip, and other Seeds.* (December 8, 1911).

The object of this invention is to provide an improved machine for sowing turnips, mangold and other seeds, which will reduce waste by sowing the seed in bunches at equal spaces apart in the drills.

283. *Motor Plough.* (January 3, 1912).

This invention relates to motor ploughs, and its chief object is to prevent breakage of the implement or of any of its parts if any of the shares should be arrested by a large stone, the root of a tree, or the like. Preferably, the arrangement is such that the shares are connected to the carrier or frame through the intermediary of a spring or springs in such a manner that the said spring or springs is or are extended or compressed when any of the shares are moved relatively to the frame, the said movement being transmitted to the disconnecting device so as to operate the same for disconnecting the motor. The invention further comprises improvements in the traction wheels of the plough, in order to prevent slipping of the wheels, without any earth sticking to the same.

425. *Motor Plough.* (January 5, 1912).

This invention has reference to motor ploughs of that kind wherein the plough breasts can be raised or lowered and regulated as to their working depth. One feature of the invention is the means employed for adjusting the forward ends of the plough beams relatively to the draw bar. In order to raise the breasts by hand, a spool is mounted on a power shaft, which spool can be rotated by a manual lever to raise the breasts with which it is in operative connection. When elevating the breasts by power, a device actuated automatically by the movement of the plough beams is employed for stopping the movement of the breasts after being raised a given height. A further feature of the invention consists in the provision of improved mechanism for limiting the lowering of the beasts beyond certain limits. The downward movement of the breasts is controlled by a brake shoe acting on a brake drum, the said shoe being actuated by a lever which in its initial movement releases ratchet and pawl mechanism holding the plough breasts in their elevated position, and in its continued movement operates the brake shoe to control the breasts. The breasts are held in operative position by means of resilient supports, the tension of which can be individually and collectively regulated.

28797. *Manure Distributor.* (December 21, 1911).

This invention has for its object to provide an improved manure distributor so constructed as to ensure a positive and efficient feed of the manure and a good distribution on the ground; to prevent undue working of the manure in the hopper; and to facilitate the cleaning of the distributing mechanism.

29358. *Motor Driven Cultivator.* (December 30, 1911).

The purpose of the cultivator described in this specification is more particularly to pulverise and bank soil on both sides of a row of plants.

11949. *Power Driven Plough.* (May 20, 1912).

The invention relates to power-driven ploughs of the type comprising a tractor and a plough coupled therewith, and has for its object certain improvements in this class of apparatus, relating more particularly to the method of coupling the tractor's plough frame, and to the associated appliances for manipulating the plough shares from the tractor.

4910. *Clutch Gear for Agricultural Machines.* (February 27, 1912).

According to this invention, improved transmission gear is made use of which connects the seat or the pedal to the clutch spring, and comprises a sliding member round which the connection passes, the said member being made to slide at will by means of a system of auxiliary gear which the driver can operate when he is seated for causing the action of the geared working parts to cease at will.

7814. *Rotary Harrow.* (April 1, 1912).

This specification describes improvements in the driving and operation of rotary harrows of the type in which the harrow is driven indirectely from the main driving wheels through countershafts. According to this invention the counter-shafts are carried by a framework to lie above the main shafts of the wheels and are driven from these latter by pinions, the final drive from the counter-shafts to the harrow roller being by chains.

4157. *Grain Harvester.* (Feb. 19, 1912).

The object of this invention is to provide a new grain harvester, arranged to cut the grain and bind it while in an upright position.

563 - **New Patents (German Empire).**

Patent No. 9225/45-*a*. (6. I. '13). — This drum for holding the blades of a picking plough [Fräser pflug (1)] consists of disks mounted on a square axle and connected with each other by ties. Between the disks rings are placed, and according to the width of the rings used the distance between the disks may be varied.

Patent No. 20981/45 *a* (2. I. '13). — In this machine for tilling the soil by means of several implements mounted on a revolving shaft, and which in order to free them from weeds and the like can be set to work successively, the worm wheel of the implement bearing shaft as well as the worm wheel of the crank shaft of the bearing wheels can be driven independently of each other by a common shaft.

Patent No. 10897/45 *a*. (6. I, '43). — Subsoiler for ploughs. This implement pivots round a pin in the lower end of an adjustable plate, which is fastened to the land-side plate of the plough and is connected with a spring which comes into action only when considerable obstacles are encountered, such as big stones.

Patent No. 65206/54 *c*. (20. I. '13). — Machine for lifting beets; consists of shares and of arms connected with the shares by articulated joints. The arms have an up and down motion and are so arranged that they move towards each other.

Patent No. 65740/45 *a*. (20. I. '13). — Machine plough on the double engine system. An endless cable is wound round the winding drums and each portion of cable draws an implement forwards and backwards.

Patent No. 255087/45 *c*. (28. XII. '12). — Automatic tying device for straw presses. The invention consists especially in the arrangement according to which the binder shaft itself revolves slowly and couples with the main driving shaft, thus starting the knotter, whereas formerly the measuring wheel shifted a stop for the coupling pawl.

564 - **Observations on Traction Engines.** — RINGELMANN, M.: in *Annales de l'Institut National Agronomique*, Series 2, Vol. II, Part. 2, pp. 221-241. Paris, 1912.

The writer shows with the help of diagrams and tables the results obtained in the course of 16 tests carried out with 9 different implements for working the soil. He arrives at the following conclusions: If the average draught power be taken as 100, the maximum power ranges from 110.55 to 154.70 and is required for a distance ranging from 2 to 27 per cent. of the whole distance. The great differences observed with the various machines are solely due to the nature of the soil.

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(1) See No. 1078, *B*. July 1912. (*Ed.*).

The writer therefore proposes to adopt 100 for the average haulage power and 175 for the maximum. He represents the former by t and the latter by T and establishes the following equations

$$T = 1.75\ t$$
$$t = 0.57\ T$$

It is therefore recommended to base the calculations for a traction engine, both as regards its performance and the resistence due to friction, upon 1 $^3/_4$ the average haulage power.

565 - **"Case" Steam Traction Engine.** — DE CONDÉ, M. F.: in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale,* Year 111, Second Half-year, No. 4, Vol. 118, pp. 547-551. Paris, December 1912.

The writer, after giving an accurate description with figures and principal dimensions of this repeatedly and successfully tested machine, gives an account of the results obtained at the trials made at Chelles and at Bourges respectively, with a 45 H. P. and a 60 H. P. machine of this type.

Hitherto they have been built of 30, 36, 45, 60 and 80 effective H. P. The builder states that a 60 H. P. traction engine can draw a load of 20 tons on the level and from 12 to 15 tons on gradients of 8 to 10 per cent.

566 - **Report on Clearing Land from Tree Stumps by Means of Steam Plough Engines.** — RINGELMANN, M.: in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale,* Year 111, Second Half-year, No. 4, Vol. 118, pp. 546-547. Paris, December 1912.

Communications on clearing land from tree stumps in the Belgian Congo, according to a report by E. Leplace published in the ***Bulletin Agricole du Congo Belge,*** Vol. III, No. 1.

567 - **Certani's Subsoil Plough.** — GAMPERT, E.: in *Journal d'Agriculture Pratique,* Year 77, Vol. I, No. 10, pp. 302-303. Paris, March 6, 1913.

The writer describes the subsoil plough built by M. Certani, civil engineer, which is now used with great success in the provinces of Bologna and of Ferrara (Italy). The problem that the inventor set himself, namely to apply to the side of the plough coulter an instrument intended to break up the bottom of the preceding furrow, has been advantageously solved. The object of this lateral application is to prevent the ploughed soil from being trampled by the draught animals. With a team of eight or ten oxen a depth of 20 to 22 inches by a breadth of 16 to 18 inches can easily be attained.

568 - **Tilling the Soil at One Operation.** — RUBARTH: in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 19, p. 231. Berlin, March 5, 1913.

The writer reports on some forms of his patented blade shares; after treating of the importance of this kind of implement, he gives some examples showing how the new system can be adopted in the best and simplest manner in various kinds of farms.

569 - **A New Machine for Extracting Sisal Hemp Fibre.** — *Der Tropenpflanzer*, Year 17, No. 3, pp. 152-154. Berlin, March 1913.

The firm F. Haake, of Berlin, exhibited before a number of managers of plantations belonging to companies interested in Sisal hemp the first "Roland" machine destined for German East Africa. For this purpose fresh Sisal agave leaves from Africa had been provided.

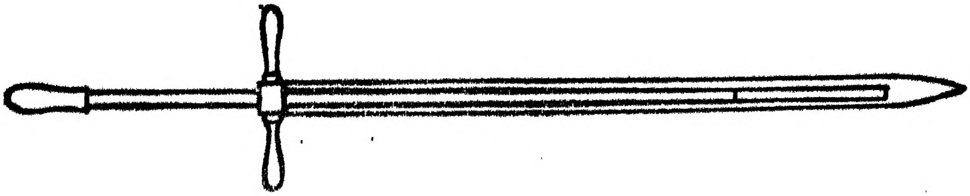
The general opinion of the experts after the trial of the machine was to the effect that it was distinguished by great simplicity and that the extraction of fibre was excellent.

The "Roland" machine is built of heavy U iron, and the intermediate gearing is mounted on the machine itself, which is besides fitted with ball-bearings of a special type, which allow it to run with extraordinary smoothness.

About 25 H. P. are required to drive it when working at its maximum.

570 - **New Sampler.** — MANDEKIC: in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 20, p. 241. Vienna, March 8, 1913.

This sampler (see figure) is about 3ft. 3 in. long and 1.4 inch in diameter and consists of a hollow cylinder provided with a longitudinal slit reaching almost to the tip, and a plunger. It is very useful for taking samples from a sack full of seeds, such as clover, cereals, grass and the like. The sampler with the plunger in it is thrust down to the bottom of the sack containing the seed to be sampled. Then the plunger is slowly drawn out and the seeds fall thrugh the slit into the hollow of the sampler. When this is full it is drawn out and its contents emptied through its upper opening.



This sampler is especially adapted for the examination of clover, as about a pound and a half of seeds can be taken out at one operation, thus saving much time. Another advantage consists in the plunger remaining movable notwithstanding the entrance of the seed so that no choking up of the slit is to be feared.

The sampler is to be had at the Royal Seed Control Station at Krizevei (Croatia).

571 – **The "May" Milking Machine.** — *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 16, p. 187. Vienna, February 22, 1913.

This patent milking machine is remarkable for the great simplicity of its construction. One person, using two of these machines, can milk from 24 to 34 cows in an hour. The sole agents for this machine, in Austria and Germany, are Messrs. P. Lübke of Breslau.

572 – **The "Unfehlbar" Automatic Milk Measurer.** — *Oesterreichische Molkerei-Zeitung*, Year XV, No. 5, pp. 69-71. Vienna, March 1, 1913.

This article contains an illustration and a description of the above-mentioned apparatus, which was patented in Germany as No. 222.478.

573 – **A New Rapid Milk Boiler with Cooling Apparatus for Continuous Work.** — AUERBACH, N. in *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIII, Part 12, pp. 270-273. Berlin, March 15, 1913.

From the researches of hygienists on raw and boiled milk the superiority of the latter appears to be proved. The writer describes the construction and working of a milk heater, which is provided with a device for automatically shutting off the supply of milk when the temperature sinks below a certain point. A heater capable of heating 53 gallons of milk per hour costs £34 6*s*. The heating can be done by gas, steam or electricity.

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574 – **A Handy Sheep Dip.** — *The Pastoralist's Review*, Vol. XXIII, No. 2, p. 164. Melbourne, February 15, 1913.

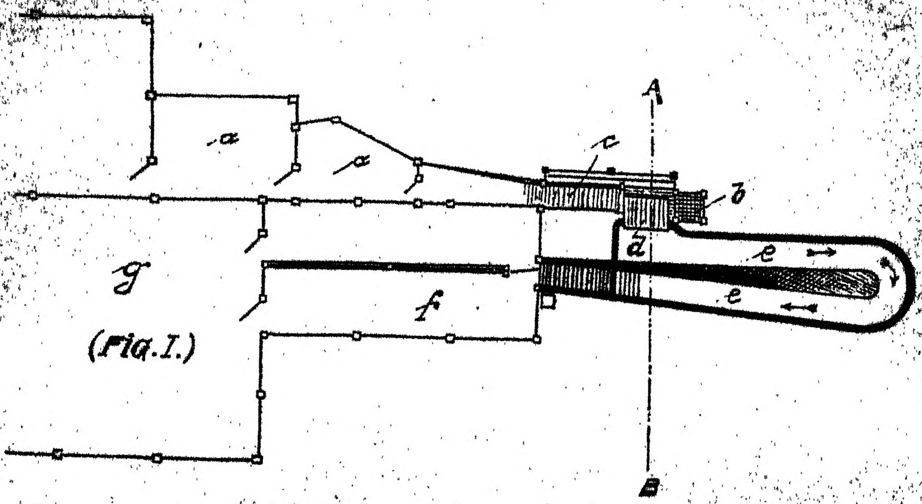
The sheep dip represented in the diagram has all the advantages of a long swim bath at a very reduced cost. The sheep swim back and come under the control of the man who is penning up before dipping them. When the draining pens are full, he has only to come through the fence and open the gates (Fig. 1).

In Fig. 2, half a dozen sheep are placed in the decoy pen (*b*) first; the others then are forced up the inclined race (*c*); on reaching the slide (*d*), they lose their footing, and glide into the bath. Between the posts on either side of the slide, there is a square curtain of raw ox-hide hung to hide the fall and catch the splash.

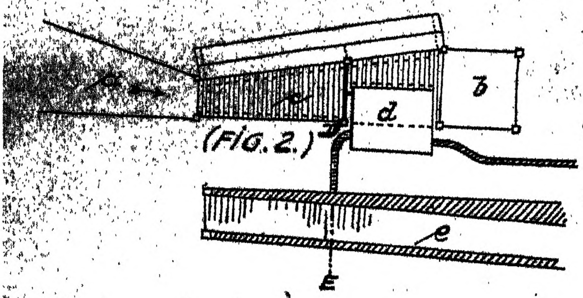
The slide is made of smooth, well-oiled, well-planed boards, so as to avoid the slightest foothold for the slipping animal. On leaving the bath (*e*), the sheep first reach the draining pens (*f*), and finally the drying yard (*g*).

575 – **Automatic Drinking Troughs.** — GODBILLE, P. Installation hygiénique de l'etable. — *L'Hygiène de la Viande et du Lait*, Year 7, No. 2, pp. 62-70. Paris, February 10, 1913.

After describing some systems of watering live stock, which owing to their defects, have not been largely adopted in practice, the writer des-

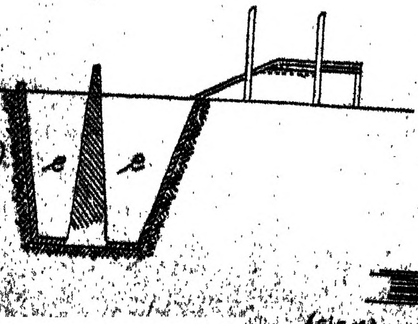

A
a
a
c
b
d
e
e
g
f
B

(FIG.1.)

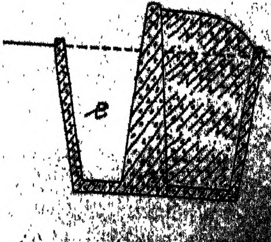


(FIG.2.)

(FIG.6.)



(FIG.5).

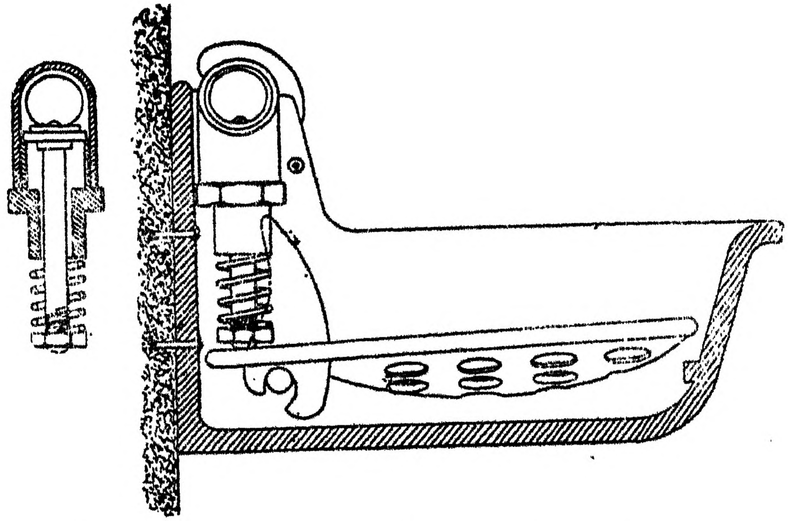


(FIG

(FIG.4)

cribes the Manfroid-Bauduim system, which is widely spread in the North of France, in Paris and in Belgium, and which from both the hygienic and the economic point of view, has given the best results.

As the annexed figure shows, this trough, which is fed directly from the water pipes or from a cistern, consists essentially of the drinking basin, in which a movable plate is so placed as to work a valve. The animal presses the plate with its muzzle and drinks at the same time. When pressure on the plate ceases the valve closes by itself by the pressure of the water and by the action of a spring.



576 — **Basket-Work Ventilators.** — *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 21, p. 255. Vienna, March 12, 1913.

Farmers are often obliged by bad weather to store hay, straw, cereals or other produce before it is dry enough. Spreading in thin layers, making use of the upper and best ventilated storerooms of the farm, and similar measures may to a certain extent save the produce for a short time from destruction, but the limited amount of space is inadequate to cope with large quantities of produce. Matters however are very different and the available space can be utilized to a much greater extent when ventilator tubes offering an easy passage to air are used, such as those that H. Schmalle of Berlin has placed on the market. They are made of a durable permeable osier work and when placed at distances of two or three feet from each other in heaps of cereals or of other similar produce they ensure a steady circulation of air, which considerably diminishes the danger of heating and moulding. These ventilators are laid cross-wise in stacks. They are about 3ft. 8in. long; those made for stacks are 6 ½ inches in diameter and those for cereals 10 inches. They cost 17*s* 6*d* to 18*s*. 6*d*. per dozen.

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577. - **Types of Farming in relation to Distance from Market.** — BRINKMANN in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 6, pp. 185-213. Stuttgart, March 15, 1913.

The very varied systems of farming depend upon the action of two opposite groups of forces: on the one hand those which lead to the specialisation of production, and which render a particular locality suitable for certain products and another locality for other products (differentiation forces), and on the other hand those which tend to unite several branches of production into a whole (integrating forces). This latter tendency is due chiefly to the three following causes: the first of which is the regular distribution of work throughout the year for the economy of human labour, of other power and of capital. This tendency leads to the distribution of the acreage of the farm among a greater or smaller number of different cultures for which the operations of sowing, interculture and harvest fall in different times.

Similar to the well known law of diminishing returns, the law of increasing expenses may be mentioned as coming into play with the extension given, beyond a certain limit, to any one crop, because instead of the union of several crops, the utilization of the soil tends to become a one-sided specialization. On the other hand the more appropriate the choice of the group of crops to be grown, in respect to the means of production employed, the lower will be the expenses per unit of surface and of production. In this connection the reciprocal complement that spring wheat and winter wheat are to each other is specially important. The same connection exists between hoed crops and forage plants, between cereals and oil seeds. The regular distribution of work throughout the year rises in importance with the intensity of farming, with the compactness of the soil and with the relatively unfavourable position of the farm respecting the market.

The second cause which leads to adopting a combination of several crops as against specializing, is the need of utilizing in the best possible manner the conditions of fertility of the soil. The various crops which enter into the rotation must complement each other in their needs for growth, as well as in the influence they exert on the fertility of the soil, so as to have as far as possible a natural reciprocal reintegration of the fertility of the soil.

Its follows thus that in the choice of the crops to be grown together, as well as in determining the area and place to be given to each in the rotation, the farmer must seek to combine the advantages which derive from one grouping of crops rather than another in its bearing upon the conservation of the fertility of the soil, together with those connected with the best utilization of the means of production employed. The more favourable the natural and economic conditions of a farm are, the more important for the combination of several crops does the principle of rotation become in comparison to the principle of the distribution of the work throughout the year.

The economy of manures in the farm is an important factor for the preservation of the fertility of the soil in respect to a given combination of crops, because upon this, in its turn, depend the rational production and utilization of the manure produced in the farm itself. In the first place the production and conservation of nitrogen and of the organic matter in the soil must be considered, and this leads to alternation of hoed crops, cereals and other crops that consume greater quantities of nitrogen with those that accumulate this element, either forage plants or plants to be used as green manure.

The third cause, lastly, is the necessity of providing for the upkeep of the means of working the farm, especially of the productive stock, which in most farms is indispensable for the production of manure and for the utilization of certain products of the soil. Most frequently, however, for physiological and dietetical reasons, it is not possible to have rational feeding without adopting mixed food rations, the needs of which must be considered in the choice of the group of crops to be grown; and as forage must be provided throughout the year, such crops must be grown as completely meet requirements during the whole time. Thus, partly for physiological reasons connected with feeding requirements and partly for agricultural and technical reasons, no individual crop can be considered independently of the bond which unites it to the other crops in respect of its utilization. Only pasture can in exceptional cases maintain its independence; all other crops cereals, meadows, clover, hoed forage plants, etc., must be considered as dependent upon complementary crops in the interest of the best utilizatian of their products.

The disturbance of the equilibrium of these three factors of a given system of farming by extending the relative area given to one crop at the expense of the others injures in three ways the economy of the whole farm: 1. The cost of production per unit of area and per unit of product increases in consequence of the increase, for one of the elements of the combination, of the cost of labour. 2. The returns diminish in consequence of the incomplete utilization of the fertility of the soil. 3. The real money value of the product diminishes on account of the difficulties encountered in the suitable working up and marketing of the same.

In opposition to the forces and factors which lead to the combination of crops and to the system of agricultural economy connected with it, other factors are at work in the direction of specializing crops and production, which point out in their turn the localities most suitable to a given crop. In the competition which takes place for the choice of such a locality, a given branch of farming may all the more easily be limited or suppressed, the smaller the advantages of its introduction into the combination of crops in respect of the utilization of the means of production, of the equilibrium of the fertility of the soil, and of the best realization of its value; or it may all the more easily be extended the less it is connected with the other branches of the system of farming.

Among the factors which concur in determining a given combination of crops in a given locality (in contradistinction to those which cause only a temporary variation in the combination), the conditions of carriage and sale are of the most vital importance because the place of production is attracted towards the markets by the possibility of saving in the cost of carriage and of marketing (concentric belts of Thünen). In this respect, hitherto only the ratio between the cost of carriage and the market prices of farm produce were taken into consideration; and the conclusion had been drawn that in a good position respecting the market it is the low priced products which cannot stand high transport expenses, that prevail, while in unfavourable conditions the prevalence is with high priced wares. But in this manner the causes of the differences in the cost of transport are not explained, but simply accepted as a given fact.

In order to understand the influence which sale conditions exert upon the locality of production, account must be taken of the variable ratio which exists among the different factors of the cost of production, and between them and the costs of carriage and of sale on the market, for a given unit of saleable products; and secondly of the variable area necessary for their production.

Among the factors determining the choice of the locality of production, the first place is occupied by the elements of cost which vary with the favourable position as regards the market and with the various products. Among these' the costs of carriage and sale act centripetally and partly centrifugally : that is to say the elements of cost which are due to labour and to the agricultural part of the working capital act centrifugally, while the expenses of purchase deriving from the commercial part of the working capital act centripetally (1) because the former diminishes and the latter increases in price according as the relative position of the farm is less favourable. In proportion as the relative position of a given production improves respecting the market, the saving in the cost of carriage, of sale on the market and of the commercial working capital is partly absorbed by the higher cost of labour and of the agricultural part of the working capital, and this all the more where these latter factors play a greater part in the total production, both absolutely and relatively.

The final influence which the market exerts on the place of production of the various products may be translated into figures by adding the differences of the total costs of production which would be obtained per unit of product for sale by diminishing the distance between the farm and the market by a given distance. The items of saving would represent the positive element, the increase of expenses the negative element. The amount of this sum depends upon the ratio of these items to each other. It represents the effective saving obtained after deducting from the gross savings the increase of outlay, and may be considered as the index of saving per unit of saleable produce. It may then be said that, other conditions being equal, the product which has the maximum savings index occupies in respect to the market the most favourable locality of production.

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(1) The agricultural part of the working capital is that which may be produced in the farm itself (forage, litter, stable manure): the commercial part must be bought (oil cakes, chemical manures).

Thünen, who has made some comparisons of the kind, has arrived at the following general law: With equal production per unit of area, the crop which requires the greatest expenses must be located at the greatest distance from the town. Nevertheless, for the above mentioned reasons, this law is not always absolutely true.

The farmer endeavours to secure the maximum profit, not only per unit of product taken to market, but especially per unit of cultivated area, or in other words the maximum profit on the land; this is determined not only by the gain per unit of produce taken to market, but also by the number of these units which may be obtained from a given area. Thus the adoption of the systems of agricultural economy from the point of view of the sale conditions of the products, of the cost of carriage and sale on the market, is after all determined not by the saving of expenses per unit of product but by the gain per unit of area. This gain may be called the index of the profit on the land; it is obtained by multiplying the profit index per unit of saleable product by the number of units furnished by one unit of cultivated area.

It is only for those products which have the same requirements as to the extent of area necessary to produce the same unit, that the index of saving on cost of carriage and sale prevails practically over the index of profit on the land, especially when the first index is influenced by the transport rates.

The writer then shows, by means of an example with figures, that a series of products arranged according to the decreasing order of their values coincides with the series obtained by arranging them according to the increasing profit on the land. This confirms the justness of the empirical law according to which, with equal cost of carriage and of sale and with equal proportion between the various groups of the cost of production, the least valuable products are raised in the neighbourhoods of the markets, and vice versa, with the only difference that until now the positions of cause and effect had been inverted in the explanation of the causes which determine the locality of production: the difference in value was considered as the cause of the fact and consequently of the system of farming, whilst in reality the causes lie deeper and the difference in value must be partly considered as an effect of the situation of the place of production.

In studying the facts of the adaptation of the combination of crops to the conditions of sale, from the point of view of the least cost of delivering the products on the market, one comes to the same conclusion: that the index of the profit on the land is decisive, because as every product must compete with the others for the best locality of production, the profit on the land deriving from these products forms part in its turn of the total cost of production of the product in question and weighs more or less heavily upon it.

Considering the fact from a purely theoretical standpoint, a product which has a negative index of savings, even without being charged with the profit on the land, may be delivered cheaper from districts further from the markets than from those situated nearer.

The writer does not believe, however, that this is the case in the instance quoted by Thünen, namely of butter making; but he admits that it may happen for other products, certainly for cotton and probably for flax.

As for the problem of the adaptation of the combination of crops to the conditions of sale, from the point of view of quantity, the necessity of a combination of crops prevents the formation of belts in the strict sense of a real specialisation or distribution of production; it does not, however, exclude the quantitative variation of the branches of production under the influence of the local conditions of sale. The more favourable these conditions are, through the relative position of the farm to the markets, the greater is the number of saleable products which may form part of the combination of crops in order to suit the requirements of a multiplicity of production.

Considering then the ratio existing between products rendered marketable by means of the various agricultural industries and the products not rendered marketable in this way, from the point of view of the relative position to the markets, it is clearly seen that the more unfavourable this position is, the greater the need for the farm to render its products marketable by means of industrial processes so as to reduce in general the weight of the products to be carried to the market, which amounts from the economical point of view to a diminution of the index of the profit on the land. Besides, the products not rendered marketable by means of agricultural industries generally show a higher index of expense for manures; they therefore tend to localize in the neighbourhood of the markets, that is to say where the fertilizing materials taken from the soil can be returned to it more cheaply.

578 - The Sizes of Agricultural Holdings in England and Wales in 1911 and 1912.

— Agricultural Holdings. — *Board of Agriculture and Fisheries, Agricultural Statistics*, 1912, Vol. XLVII, Part I, pp. 6-8. London, 1913.

The number of agricultural holdings — *i. e.* of separate occupations of agricultural land exceeding one acre in extent — in 1913 was in England 374 809 and in Wales 61 077, together 435 886, being an increase of 576 over 1911. The increase was due to holdings of from 5 to 300 acres, which increased by 1301, while small holdings of less than 5 acres and large occupations of over 300 acres decreased in number by 550 and 175 respectively.

Since 1905, 628 of the larger farms (of over 300 acres) have disappeared, being for the most part subdivided into smaller holdings. During the same period, holdings of 50 to 300 acres have increased by 1 088, holdings of 5 to 50 acres by 2 229 and those of 1 to 5 acres by 624. The number of persons occupying land in England and Wales (so far as these returns may be regarded as representing separate occupations) has increased in the course of seven years by 3 313. It is to be remembered that during that period, the farmed area has diminished by 231 000 acres, involving of necessity the extinction of a large number of holdings. A net increase of the number of holdings into which the dwindling agricultural land is divided is consequently the more significant.

Large farms, nevertheless, still occupy a very considerable portion of the land of the country. About 25 per cent. of the total farmed area is divided into farms exceeding 300 acres, while nearly 60 per cent. is taken up by medium farms of 50 to 300 acres. Small holdings of 50 acres and under, though forming about two-thirds of the total number of the occupations, account for little more than 15 per cent. of the agricultural land of the country.

The difference between England and Wales as regards the size of the holdings is considerable. In Wiltshire 55 per cent., in Northumberland 49 per cent., and in Berkshire, Cambridge, Dorset and Hampshire about 47 per cent. of the agricultural land is farmed in holdings of over 300 acres. On the other hand, in the whole of Wales (with the exception of Radnor), in Cheshire, Cornwall, Derbyshire, Lancashire and Monmouth not more than 10 per cent., and in Lancashire and half the Welsh counties less than 5 per cent. of the land is taken up by "large" farms.

Of the 374 809 holdings in England in 1912, there were 81 884 (21.85 %) of from 1 to 5 acres, 168 038 (44.83 %) of from 5 to 50 acres, 110 657 (29.52 %) of from 50 to 300 acres and 14 230 (3.8 %) of over 300 acres; while in Wales, the numbers were respectively: 10 314 (16.89 %), 32 484 (53.18 %), 17 937 (29.37 %) and 342 (0.56 %).

579 - **Determining the Price of Sugar Beets in France.** - PLUCHET, E.: in *La Vie agricole et rurale*, Year 2, No. 16, pp. 437-439. Paris, March 22, 1913.

If the sugar manufacturer wishes to ensure a sufficient supply of raw material for the autumn, he is obliged to purchase the sugar beets in February or March, *i.e.* two months before the crop is sown. The amount he obtains depends upon the yield per surface unit of the land. If 30 000 metric tons are required annually to supply the sugar-factory, the owner tries to purchase the crop of 1000 hectares which are estimated as producing an average of 12 English tons per acre. This contract is very advantageous to the farmer, who thereby ensures a market for his crop in a good or a bad year. On the other hand, the sugar-manufacturer has no guarantee as to the amount of the consignment; for the yield may be 25 per cent. above or below the average, so that instead of 30 000 tons he may get only 22 500 or as much as 37 500 tons. In the first case, the manufacturing cost per ton of sugar beets will be much higher; in the second, the unusual prolongation of the working season necessitates unusually long storage of the beets, with a consequent loss of sugar.

In order to reduce this risk to a minimum, the writer suggests that the following principal method of purchasing the raw material should be adopted: The farmer shall undertake, either to deliver a certain fraction of the average estimated crop of the area under beets (*e.g* $^5/_6$ of the yield of 10 hectares at 30 tons per hectare, *i.e.* 250 tons), with the reservation that he shall have the right of the disposal of any surplus; or to supply the whole estimated amount (300 tons) plus or minus 10 or 15 per cent.

The price of sugar beets depends upon their quality and upon the price of sugar quoted on the Paris Bourse at the time of purchase.

The quality is estimated by the density of the juice, which is ascertained when the consignment is made. The price of sugar beets per ton is fixed for roots of 1.070 density, or as it is usually termed, 7° of density. For every tenth of a degree above or below 7°, the price rises or falls by a sum varying from 30 to 50 centimes according to arrangement. In the writer's opinion, it would be far juster to estimate the price of the beets from the actual sugar content, rather than from the density of the juice.

The second factor which determines the price is the difference between the price per quintal quoted for sugar No. 3 (white sugar) by the Paris Bourse for the time of extraction, at the date when the manufacturer makes his contract with the grower, and that of a ton of sugar beets of 7° density delivered at the factory. This difference represents the margin for manufacturing costs and profit, and cannot be less than 6 fr. (or 5 fr. after subtracting carriage and brokerage).

The sugar manufacturer endeavours to insure himself against loss by taking contracts for sugar based upon the contract he has already made for the purchase of beets; but owing to the present method of buying beets, which depends upon the yield of the surface unit, he may lose heavily, as the crop is subject to great variations. Thus in the bad year of 1911, many sugar-manufacturers, in order to fulfil their contracts, were obliged to purchase larger or small quantities of sugar at considerably higher prices, although they had prudently only engaged themselves to deliver from 80 to 90 per cent. of the amount of sugar which they expected to obtain from their contracts for the purchase of beets.

The writer recommends the adoption of the following method of fixing the price of sugar beets: The buyer and seller shall fix a difference between the price of beets and that of sugar, which will leave a moderate margin of profit to the manufacturer. The seller shall have the right to determine the date at which the price of the beets shall be settled, this depending upon the prices of sugar quoted on the Bourse. Should the price of sugar quoted by the Paris Bourse in February and March (the date of the sale-contract) not seem sufficiently high to the farmer, he shall have the right, until September 30, to take the prices quoted for sugar by the Paris Bourse at any date he likes as the basis on which to determine the price of beets for the working season of the sugar factories (October, November, December). If he prefers to fix the price of the beets according to the sugar market at periods other than that of the manufacturing (4-month periods beginning January, March or May), he has only to inform the buyer by letter, and the price will be fixed by the quotation for sugar on the Paris Bourse the day following that on which his letter is received at the factory. Should this period chosen by the seller be the period of manufacture, the price of one ton of beets of 7° density is that of one quintal of sugar over the three-month period beginning October, less the difference agreed upon; but should the grower have chosen a later period, the amount to be subtracted is increased by 25 centimes for every month, in order to compensate the manufacturer for the increased expense of storing, insurance, etc.

Example: X, a grower, sells in March to Y, a manufacturer, 400 tons of sugar beets on the basis of 7° density and that the fixed sum to be subtracted from the sugar price is 6 fr. The Bourse quotes No. 3 sugar at this date as 29 fr. per quintal for the quarter beginning October; this would give 23 fr. per ton of beets, which X considers too low. At a given date between March and September 30, the price for the quarter beginning October is 31 fr.; X informs Y by letter that he wishes to settle the price, which is effected by adopting the price quoted by the Bourse the day after the receipt of the letter, for the quarter beginning October. If the price of sugar does not rise by September 30, X waits still longer, and after a certain time, the price of sugar for the 4-months beginning May is quoted at 34 fr. X informs the manufacturer, and the price of the beets is settled at $34 - (6 + 8 \times 0.25 \text{ fr.}) = 26$ fr.

It would be reasonable to arrange that if the price of sugar should rise above a certain fixed limit, *e.g.* 35 fr., the surplus should be divided between the grower and the manufacturer. The writer is of opinion that the adoption of this method would be to the advantage of both grower and manufacturer.

580 - **Ten Years' Returns of a Cherry Orchard in Holland** (1). — **Rentabiliteitsproef met een kerseboomgaard.** — *Departement van Landbouw, Nijverheid en Handel, Verslagen en Mededeelingen van de Directie van den Landbouw*, No. 1, pp. 57-59. The Hague, 1913.

In 1900, a cherry orchard of ½ hectare (about 1¼ acre) was laid out at Uden in Holland; standard trees of two varieties (Black and Spanish) were planted 26 ft. apart. The cost of making the orchard was £28 18*s* 6*d* and the value of the land was £ 14 17*s* 6*d*, so that the whole capital expended amounted to £ 43 16*s*. Potatoes and kohl-rabi were grown every year as intercalary crops; the net profit of these was about 16*s* 6*d*. The receipts and expenditure for the year 1900 were as follows:

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(1) See No. 1039, *B*. Dec. 1912. (*Ed.*).

Expenditure	£	*s*	*d*	*Receipts.*	£	*s*	*d*
Interest on capital laid out, at 4%	1	15	0	Net profit of potatoes and turnips.		16	6
Amortisation of outlay, at 2% .		11	6				
Cost of manuring	4	2	9				
Wages of labourers	1	13	8				
	£ 8	2	6				

There was thus a loss of £ 7 6*s*, or £ 5 18*s* 3*d* per acre. In 1901, this loss was increased by 6 per cent. (8*s* 9*d*) by the sums paid for interest and depreciation; in 1902 by the extra expenditure of 1900 and 1901, so that it amounted to 8*s* 9*d* + 9*s* 3*d* = 18*s*; in 1903 to 18*s* + 9*s* 9*d* = 27*s* 9*d*; in 1904 to 27*s* 9*d* + 10*s* 6*d* = £ 1 18*s* 3*d*; and in 1905 to £ 1 18*s* 3*d* + 11*s* = £ 2 9*s* 3*d*.

The cherry trees bore for the first time in 1906; from that date until 1911 the balance was as follows:

1906.

Expenditure.	£	*s*	*d*	*Receipts.*	£	*s*	*d*
Expense as in 1900	8	2	6	Potatoes and kohl-rabi		16	6
Interest on loss in 1905	2	9	3	Cherries	3	6	0
Total . . .	10	11	9	Total . . .	4	2	6
Subtract	4	2	6				
Loss . . .	6	9	3				

Loss per acre £ 5 4*s* 8*d*.

1907.

Expenditure.	£	*s*	*d*	*Receipts*	£	*s*	*d*
Expense as in 1906	10	11	9	Potatoes and kohl-rabi		16	6
Interest on loss in 1906		7	9	Cherries	7	8	9
Total . . .	10	19	6	Total . . .	8	5	3
Subtract	8	5	3				
Loss . . .	2	14	3				

Or per acre £ 2 4*s*.

1908.

Expenditure.	£	s	d	*Receipts.*	£	s	d
Expenses as in 1907	10	19	6	Potatoes and kohl-rabi		16	6
Interest on loss in 1907		3	3	Cherries	10	15	0
Total	11	2	9	Total	11	11	6
				Subtract	11	2	9
				Net profit	0	8	9
				Or 7*s* 1*d* per acre.			

1909.

Expenditure.	£	s	d	*Receipts.*	£	s	d
As in 1908	11	2	9	Potatoes and kohl-rabi		16	6
				Cherries	11	11	6
				Total	12	8	0
				Subtract	11	2	9
				Net profit	1	5	3
				Or 20*s* 6*d* per acre.			

1910.

Expenditure.	£	s	d	*Receipts.*	£	s	d
As in 1909	11	2	9	Potatoes and kohl-rabi		16	6
				Cherries	16	10	9
				Total	17	7	3
				Subtract	11	2	9
				Net profit	6	4	6
				Or £5 0*s* 10*d* per acre.			

1911.

Expenditure.	£	s	d	*Receipts.*	£	s	d
As in 1910	11	2	9	Potatoes and kohl-rabi		16	6
				Cherries	20	13	3
				Total	21	9	9
				Subtract	11	2	9
				Net profit	10	7	0
				Or £8 7*s* 6*d* per acre.			

581 – **Scheme of Prizes for Best Managed Small Holdings. Suggestions to Competitors.** — *Board of Agriculture for Scotland, Leaflet No. 6*, 4 pp. Edinburgh, February 1913.

The Board of Agriculture for Scotland started in 1912 a Scheme of Prizes for small Landholders, whose holdings were best kept and managed. These small landholders include all occupiers of holdings rented at not more than £50, or rented at more than £50, but not exceeding 50 acres in extent, exclusive of common grazings.

The following points will receive the attention of the judges:

1) The conditions of the house and premises, including, stables, byres and poultry houses.

2) The number and quality of the stock; the croft should be sufficiently stocked and attention paid to pig-rearing.

3) Cropping and cultivation; the extent of the waste land, the condition of the crops, rotation, drainage, the increased size and improved arrangements of the fields, and the hedges and shelter-belts planted.

582 – **Dairying versus Fattening.** — Bondy, August: in *Wiener landwirtschaftliche Zeitung*, Year 63, No. 19, pp. 231-232. Vienna, March 5, 1913.

The writer speaks of the reasons governing the choice of either of these industries and then gives diagrams and tables showing the results for 10 years (1902-1912) obtained in the farm under his direction, where both dairy cows and cattle for fattening were kept. According to these data, the former branch of the industry had been remunerative during the ten years in question, while the latter had been a loss.

583 – **Rotations in the Middle West of the United States.** — Snyder, A. H. The How and Why of Crop Rotation. — *Successful Farming*, Vol. XII, No. 2, pp. 10-11. Des Moines, Iowa, February 1913.

After setting forth the chief rules to be observed in selecting a rotation, the writer gives some rotations suitable for the farms of the Middle West States and describes, by means of diagrams, the necessary division of the fields according to whether the farmer is chiefly interested in raising cereal crops, or in cattle-breeding.

AGRICULTURAL INDUSTRIES

DAIRYING

584 – **The Effect of Freezing upon the Composition of Milk.** — Mai, C. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part 5, pp. 129-131. Hannover, March 1, 1913.

In order to ascertain the effect of frost upon milk, the writer carried out five experiments. The milk was, in every case, placed in closed zinc cans and put in the open to freeze.

I. — Ten litres of milk were exposed for 15 hours to a temperature of - 3°C. (26.6°F.). When the vessel was opened, the milk appeared to have undergone no alteration; a thick layer of cream had risen and the milk was liquid. Only when it was poured through a sieve, could it be seen that some crystals up to 3 inches in length were floating in the milk. The total weight of these crystals was 50 gr.; the fat content was 2.1 per cent, and the refractive index 26.8 according to the scale of the Zeiss dipping refractometer. The composition of the original milk was: specific gravity 1.0324, refractive index 39, fat 3.4 per cent., solids not fat 5.05 per cent.

A can of water, placed near the milk, was frozen nearly solid in 15 hours.

II. — A can containing 20 litres was filled with milk of the following composition: specific gravity 1.0315, refractive index 39.2, fat 3.5 per cent., solids not fat 8.84 per cent. After the can had remained for a day and two nights in a temperatire of -10°C. (14°F.) the appearance of the contents was as follows: above lay a mass of somewhat loose, frothy, flaky ice weighing 1 kg.; in the middle were 3 or 4 litres of liquid milk, while the bottom and sides of the vessel were covered with a thick coating of solid ice. The following figures were obtained:

	Specific wieight	Refractive index	Fat per cent.	Solids not fat per cent.
Upper loose ice. . .	1.0175	34	7.7	6.3
Liquid portion . . .	1.0450	50	2.5	11.87

The whole contents were again replaced in the receptacle, which was then shut up in a room at + 18° C. (64.4° F.) until the milk again became completely liquid; this took two days and a night, while the water in another vessel, which had been frozen solid, thawed completely in scarcely half the time. The thawed milk had the following composition: specific gravity 1.0316, refractive undex 39.9, fat 3.5 per cent, solids not fat 8.85 per cent.

III. — Ten litres of fresh milk were exposed to a temperature of — 6°C. (21.2°F.). After 14 hours, the writer observed that a crust of ice as thick as a finger had formed on the sides of the vessel; the can was closed and exposed for another 24 hours to the same temperature. The results were: the upper portion was frozen into frothy flaky ice with a weight of about $^{3}/_{4}$ kg.; the portion which had remained liquid, about 4 litres, was passed through a sieve, and the ice crust which was adhering to the walls was thawed and added to the rest of the milk. The following figures were obtained:

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk	1.0317	38.5	3.4	8.87	6.5
Upper loose ice	1.0233	37.5	11.1	8.57	—
Ice adhering to sides.	1.0165	28.0	3.2	4.92	—
Portion which had remained liquid	1.0534	52.2	2.0	13.85	—
Again combined	1.0321	38.5	3.3	8.95	7.3

IV. — Ten litres of milk were exposed for 16 hours to a temperature of - 8°C. (17.6F.); the contents of the vessel had a similar appearance to that in experiment III; the liquid portion, which was passed through a sieve, contained translucent crystals. After the component parts had been analysed they were again combined. The results are given in the following table:

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk	1.0312	38.7	3.6	8.78	7.1
Crystals	—	35.3	3.0	—	—
Portion which had remained liquid	1.0352	41.3	2.9	9.65	8.0
Ice adhering to sides.	1.0172	30.4	5.8	5.75	3.8
Recombined	1.0320	38.7	3.5	8.96	7.4

V. — In order to observe the results in the case of milk which had been quickly cooled to a low temperature, the writer cooled 10 litres to 0°C. (32°F.) shook it thoroughly and then left it for 30 hours in a temperature of from - 15° to - 18°C. (5° to - 0.4° F.). A small portion of the milk was taken for the purpose of observing it when turning sour; this was kept in an ice-chamber, but unfrozen. The contents of the vessel presented the same appearance: after separation of the parts, the whole was left standing for three days at a temperature of from + 3 to 4° C. (36.4° to 39.2° F.), and then again examined. The following table gives the results of this experiment:

	Specific gravity	Refractive index	Fat per cent.	Solids per cent.	Degree of acidity
Original milk	1.0318	38.6	3.7	8.94	6.2
Upper loose ice	1.0256	40.2	11.6	9.30	8.2
Portion which remained liquid	1.0534	53.5	3.3	14.17	11.0
Ice adhering to sides.	1.0201	30.1	2.9	5.75	3.8
Recombined	1.0320	38.7	3.6	8.97	7.2
Milk in refrigerator.	—	38.6	—	—	7.0

The experiments further showed that freezing does not perceptibly alter the smell and taste of milk, but when milk has been frozen, on thawing it turns sour more quickly.

On the strength of these experiments, the writer advises caution in taking samples of milk in winter and says that milk which has been frozen should be sold at a low temperature, but not before it has completely thawed.

585 – **The Composition of Ewes' Milk in Hungary: Analytical Results from the Municipal Laboratory of Agricultural Chemistry at Kecskemét.** — BIRÓ, GUSZTÁV: in *Kisérletügyi Közlemények*, Year XVI, No. 1, pp. 89-96. Budapest, January-February 1913.

The milk yield of the ewes belonging to the Racka and Cigája breeds at present reared on the great plain of Hungary being relatively small, the Royal Hungarian Agricultural School at Kecskemét is trying whether this can be increased by crossing them with the Frisian breed.

The following table gives the average of the analyses of the milk of 25 ewes of the Racka × Frisian cross, and 25 of the Cigája × Frisian cross. Milking was done three times a day: morning, noon and evening.

	Specific gravity of the milk	Specific gravity of the serum	Specific gravity of the dry matter	Total solids	Fats	Solids not fat	Ash
				per cent.	per cent.	per cent.	per cent.
April	1.0370	1.0338	1.2503	17.57	6.34	11.23	0.78
May	1.0374	1.0335	1.2428	18.40	6.84	11.78	0.80
June	1.0370	1.0327	1.2349	19.17	7.41	11.75	0.72
July	1.0372	1.0328	1.2283	19.56	7.03	11.07	0.77
August	1.0364	1.0330	1.2087	20.63	9.02	11.55	0.82

586 – **The Lisbon Milk Supply.** — NOGUEIRA, J. V. PAULA: in *Boletim da Associação Central da Agricoltura Portuguesa*, Second Series, Vol. II, No. 1, pp. 24-30. Lisbon, January 1913.

Critical description of the hygienic conditions of the milk trade in Lisbon, followed by the proposal of a municipal control of such trade, as voted by the « Sociedade Portuguesa de Medicina Veterinaria ». In the proposal it is urged that the milch cow stables within the city be suppressed; that the milch animals should not be allowed to be driven about the streets, that the cows whose milk is intended for sale in the city should be submitted to sanitary examination, as well as the milkers and milk salesmen, and that the milk sold in the city be from time to time submitted to chemical and bacteriological exmination.

The milk shops are to sell only whole milk (with at least 3 per cent. of butter fat) or only skimmed milk; and that only three grades of milk be allowed for sale: certified milk, that is supplied by animals that have undergone the tuberculin test and that are properly kept, such milk to be milked and kept with special hygienic precautions; common milk; pasteurized milk.

587 – **The Estimation of the Efficiency of Commercial Rennet.** — VAN DAM: in *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstation*, No. 12, pp. 5-33. The Hague, 1912.

An account of experiments with Devarda's method for determining the coagulating property of commercial rennet, which the writer shows to be unsatisfactory. A new method, devised in the Hoorn laboratory, is subsequently described and recommended.

588 – **Study on the Technique of the Manufacture of Parmesan Cheese, Lodi Type.** — SAMARANI, CARLO: in *Bollettino del Ministero di Agricoltura, Industria e Commercio, Relazioni e studi scientifici e tecnici*, Year XI, Series C., Part 11-12, pp. 39-42. Rome, 1912.

This is a chemical and bacteriological investigation on the various phases of the manufacture of Lodi cheese and a determination of the most favourable temperature conditions and bacterial content in each of them. The work was carried out in the laboratory of bacteriology of the Royal Experiment Station for Cheese-making.

Starting from the results obtained, the writer has devised a method of cheese-making based on the following processes: 1) the milk is skimmed cold, and flows into the boiler with the same degree of acidity that it has when freshly milked (about 4° of acidity Soxhlet); 2) introduction into the milk of a culture of lactic bacilli of the greatest fermentative energy in the proportion of 4 ½ cubic centimetres per gallon; 3) keeping the cheeses for 12 to 24 hours at a temperature of 37 to 40° C.

589 – **A Thread-Forming Lactic Acid Bacillus *(Bacillus casei filans)*.** — GORINI: in *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 37, No. 1-3, pp. 1-3. Jena, March 8, 1913.

The description of a new thread-forming lactic acid bacterium, which was isolated 10 years ago by the writer from Grana cheese, and which has preserved its thread-forming property.

590 – **Reactions for Distinguishing Fresh Milk from Boiled Milk.** — BICKEL: in *Molkerei-Zeitung*, Year 23, No. 9, pp. 98-101. Berlin, March 1, 1913.

The writer tested the reactive properties of several guaiacum tinctures and guaiacum-guaiacol tinctures, and examined the effect of the addition of hydrogen peroxide, used as a preservative, upon the guaiacum reaction.

The experiments, which turned out in favour of the guaiacum-guaiacol tinctures, showed that the addition of a small amount of hydrogen peroxide slightly increases the reaction.

591 – **The Determination of the Fat Content of Cream by Dr. Köhler according to Du Roi-Hoffmeisters Rinsing Method.** — HOFFMEISTER: in *Oesterreichische Molkerei-Zeitung*, Year 20, No. 6, pp. 83-85. Vienna, March 15, 1913.

The writer draws attention to the defects of Gerber's dilution method for determining the fat content in cream, and then describes a modified method adopted by Dr Köhler (of Prenzlau), which differs from the former in the fact that the pipette in which the cream is measured, is rinsed with water from above. The writer considers this simpler and more exact method as the most suitable for introduction into general practical use. The manner in which it is carried out is explained by means of illustrations.

592 – **The Money Value of Skimmed Milk.** — KIRCHNER: in *Molkerei Zeitung*, Year 23, No. 7, pp. 73-75; No. 8, pp. 87-88. Berlin, February 1913.

The writer estimates the feeding value of skimmed milk according to the most usual methods, and comes to the conclusion that, in estimating the value of whole milk in Germany, at least 1 ½*d* per gall. must be set down as the value of the skimmed milk.

593 – **Model Dairy at Riga.** — FISCHER, ALB. Ein vorbildlicher stadtischer molkereibetrieb. — *Molkerei-Zeitung*, Year 27, No. 15, pp. 271-273. Hildesheim, February 21, 1913.

The writer mentions in a few words the newly-established Central Dairy in the city of Riga, which has been equipped according to the newest principles of hygiene and dairy technique. It need only be added that arrangements have been made for supplying cream cheese, as well as yoghurt, kefir, homogenized milk, and nursery milk; a special cowshed has been built for the latter purpose.

594 – **The Nursery Milk Establishment of the Town of Stendal, Germany.** — *Deutsche Schlacht- und Viehhof-Zeitung*, Year 13, No. 9, pp. 129-130. Berlin, March 2, 1913.

Infant mortality has considerably decreased in Stendal since the existance of the Nursery Milk Establishment, which was founded some years ago. In 1911, 15.4 per cent. of the infants given the nursery milk died before completing their first year, while the mortality amongst children reared on other milk amounted to 30.5 per cent. In order to decrease the death rate still further, it was decided to pasteurize the milk in future and only to admit such cows to the shed of the nursery milk establishment as had passed a searching veterinary examination, instead of relying, as heretofore, merely upon the results of the tuberculin test.

MEAT INDUSTRY

595 – **The Supplying of the French Meat Market.** — HITIER: in *Bulletin de la Société de l'Encoubagement pour l'Industrie Nationale*, Year 112, No. 2, pp. 336-343. Paris, February 1913.

M. Hitier first compares the stock census of 1910 with that of 1911 and thereby shows that the number of stock in France, with the exception of sheep and pigs, is increasing. The number of horses rose from 3 197 7300 in 1910 to 3 236 110 in 1911. In 1911 the mules had increased by 1 300 head over 1910, though the number of donkeys had somewhat diminished. In 1911, over 60 000 horses were slaughtered for meat in Paris.

The total number of cattle in 1911 was 14 552 430, as against 14 532 030 in 1910. The cows increased by 10 400 head and the bulls (1) by 121 770, but there was a decrease in young cattle and steers; this is attributed by the writer to increased export and to earlier maturity.

The 1911 census showed a further decrease in the number of sheep, which was 694 370 less than in the previous year. The decrease occurred in all classes, but was especially noticeable in the case of ewes. About 1 000 000 sheep are annually imported into France.

The number of pigs, which was 6 900 250 in 1910, had fallen in 1911 to 6 719 570; while in the latter year, 200 000 head were imported, and in 1912 over 400 000. The writer attributes this continual decrease in pigs to a deficiency of suitable food (potatoes).

If the results of the census are compared with the increase in population, it is clear that in spite of the increasing number of cattle exported, France can produce much more meat than is required for her own needs.

M. Hitier also considers the question as to how far Madagascar and West Africa could supply France with meat. According to Prof. Moussu, who has studied live stock in these districts, cattle-breeding is one of the chief sources of revenue of the Madagascar farmer. The cattle (exclusively zebus) produce meat of good flavour, but the animals are not scientifically treated and mature late. Official statistics, in which the wild native breeds of the island do not appear, give the number of zebus as roughly 4 500 000, of which about half are females. Each year some 500 000 zebus are slaughtered. As from 250 000 to 300 000 head amply supply the wants of the island, Madagascar could send every year at least 100 000 zebus to France if the trade were properly organized (2).

The official statistics of French West Africa give the number of cattle as 5 000 000. These belong partly to the zebu and partly to the N'Dama breed. Though the latter are useless for export on account of their small size, yet when crossed with zebus they give very satisfactory results. The zebus of the French Congo fatten easily; their average weight is 660 to 1 100 lbs. and they kill 50 to 55 per cent. In the Sudan, the price of a zebu is from 35 to 50 shillings, but it is twice as much in Dakar.

M. Hitier also deals with the best method of transporting the meat to Europe and recommends the creation of Cold Storage Depots and refrigeration of the meat.

In the last two chapters, the questions are discussed of the arrangement of the existing slaughter-houses and the inspection of consignments of frozen meat from America and Australia. The writer lays stress upon the suitable arrangement of the slaughter-houses (especially their equipment with cold storage chambers), the necessity for slaughter-houses in cattle-rearing districts, and for forbidding the export of animals taken to the municipal slaughter-houses. It is also very desirable that the declaration of frozen meat be obligatory, as since January 6, 1912, portions of carcasses, as well as whole carcasses, may be imported.

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(1) In this category are placed bull-calves to be kept for breeding (taurillons) as those that will be castrated (bouvillons). The writer considers this division ill-chosen.

(2) See No. 50, *B*. Jan. 1913. (*Ed*).

596 – **Pregnant Animals slaughtered in Germany in 1918.** — Zeeb: in *Deutsche Schlacht- und Viehhof- Zeitung*, Year 13, No. 9, p. 128. Berlin, March 2, 1913.

The writer gives a summary of the number of cows, ewes and sows, which during the second half of the past year were found to be pregnant when slaughtered at the large slaughter-houses in Germany. He also gives the weights of the foeti.

WINE-MAKING

597 – **Studies of Wines.** — Paris, G.: in *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year XI, Series C, Parts 11 and 12, pp. 1-29. Rome, November and December 1912.

In this report, which is supplemented by many tables, the writer (Director of the Laboratory of Agricultural Chemistry at the Royal School of Oenology at Avellino) deals with a certain number of questions in 9 chapters bearing the following titles: The nitrogen content of natural wines. Researches and studies concerning the presence of citric acid in wines. — The presence of nitrates in wines. — The determination of free tartaric acid in wines. — The estimation of volatile acidity in wines. — The use of sulphur dioxide in wine-making. — The tests proposed by the Society of Swiss Chemists for testing wines. — The composition of the musts and natural wines of the Provinces of Avellino and Benevento. — The Vigilance Service for the application of the law of July 11, 1904 (No. 338), which aims at preventing fraud in the manufacture and sale of wines.

598 – **The Effects of Transport upon Wines.** — Mathieu, L. Vins et voyages. *Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 10, pp. 305-307. Paris, March 6, 1913.

Wines which have travelled far often become turbid and lose some of their bouquet and occasionally acquire a distinctly bitter taste. These alterations are caused by excessive susceptibility to oxidation on the part of the wine, due partly to the presence of easily oxidisable substances, and partly to its very high oxydase content. The latter is especially a consequence of bacterial fermentations, which take place in these wines after bottling. Fortunately, the experience of nearly half a century has proved that bottled wines, if pasteurized, can be kept in high temperatures and transported under any conditions, without their susceptibility to oxidation giving rise to any permanent depreciation even in the case of long journeys, or when the bottles are partially empty. For this reason, the writer confidently recommends pasteurizing bottled wines.

599 - **Crystalline Deposits in Wines.** — MATHIEU, L.: in *Journal d'Agriculture pratique*, Year 77 (1913), Vol. I, No. 8, pp. 240-241. Paris, February 20, 1913.

Small deposits of very different appearance, but formed of the same substances (potassium bitartrate and a little neutral calcium tartrate) are often found in wines. The formation of these dposits, which is larger when the wine has been exposed to a low temperature and possesses a high acid content, can be taken as a sign that the wine has not been watered. Chemists should take into account the fact that the amount of tartar precipitated represents so much decrease in the dry extract of the wine.

600 - **The Removal of Acidity from Musts and Wines.** MATHIEU, L.: in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1005, pp. 393-398. Paris, March 20, 1913.

After giving a short historical review of the subject, the writer deals with the action of cold and of various saturants in freeing musts and wines from acids, and concludes that the best results are obtained by a proper use of neutral potassium tartrate. The article also refers to the legislative side of the question.

601 - **Abnormal Musts and their Treatment.** - ASTRUC, H. in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1001, pp. 254-265. Paris, February 20, 1913.

The composition of a grape-must may vary considerably according to the effect of the weather and the parasitic attacks which the vine has undergone during the year. The anomalies affect primarily the chemical composition of the must, this being noticeably altered, and secondly they influence the natural microbic content. The writer carefully studies both these points and mentions the precautions necessary in making wine from abnormal musts.

602 - **On the Composition of the Maconnais-Beaujolais Wines from the 1912 Vintage.** — PATUREL, G.: in *Le Progrès Agricole et Viticole*, Year 30, No. 11, pp. 343-348. Montpellier, March 16, 1913.

The writer analysed 43 samples of red wines and 13 of white and the results given in the 4 tables make it possible to estimate the general composition of the whole vintage, which was that of an average year.

The alcoholic strength varies, in the case of the red wines, from 7 to 12°, and in that of white, from 9 to 12°.

603. - **The Application of Artificial Cold to Food Products (Early Vegetables, Meat, Fish, Musts and Wine) in North Africa.** - LECQ, H.: in *Revue Agricole et Viticole de l'Afrique du Nord*, Nos. 47 and 48, pp. 102-108 and 131-134. Algiers, February 1 and 8, 1913.

In this communication, which was made to the Second French Cold Storage Congress (Toulouse 1912), the writer deals with the possible application of artificial refrigeration to agricultural purposes in North Africa and treats of it especially from two points of view: 1) Exportation of perishable articles of food: vegetables, meat, fish. 2)

Manufacture of wine, particularly as regards the fermentation of musts and their transport in a natural condition.

In the second part of his paper, which is the more developed and contains very interesting details respecting wine-making in hot climates, the writer enumerates the many advantages which can be obtained from the use of artificial cold.

BREWING AND DISTILLING

604 - The Manufacture of Nipa Alcohol in the Philippines (1). - CAVEL, L.: in *Revue Générale de Chimie pure et appliquée*, Year 15, Vol. XVI, No. 2, pp. 17-20. February 2, 1913.

The leaves of the palm *Nipa. fruticans* rise from the stem a little above the soil, thus giving it the appearance of a large ornamental plant with a height of 8 to 10 ft. The plantations are situated near the sea coast and form actual forests crossed by innumerable streams. There palms grow abundantly on land alternately submerged and left dry by the tide. The fruit is formed of drupes, which on raaching maturity separate, fall to the ground and are carried away by the tide to places where the soil has become muddy and where they eventually germinate. According to Enrique Zobel and Conrado, the plant is mature at the age of 4 years; and from 1000 to 1200 occupy an acre.

The saccharose content of the sap (called « tuba ») is sometimes 14 per cent., *i. e.* nearly as high as that of the juice of the sugar beet. The writer has observed that the sap of the trees growing near the sea is the richest in sugar. The « tuba » is obtained towards the end of February, or beginning of March, after the ripe fruits are gathered. A receptacle is attached to the incised stem, which catches the sugary liquid drop by drop. It is necessary to keep on cutting the stem so that the « tuba » may not obstruct the pores. The average yield per tree is 7 ½ to 9 gallons; the amount increases during the first 50 or 60 days of the tapping, and decreases in the subsequent 30 days. If the tree is further tapped, it dies.

The must ferments of its own accord in 24 to 30 hours; it is then distilled and an alcohol of 94 to 96° is obtained. The primitive methods employed in fermentation and distillation result in a yield of from 3.8 to 4 per cent. in the case of sap with an average sugar content of 14 per cent. It would therefore by advantageous to try and improve this production, for if there are really 1000 trees per acre, each furnishing 9 gallons of 14 per cent. sap, a yield of 12500 lbs. of sugar ought to be obtained per acre; this remarkable product would be of much value to all countries with a hot damp climate, like that of the Philippines.

BREAD MAKIN

605 - The Content of Soluble Nitrogenous Substances, as a Criterion of Flour. — ROUSSEAUX, EUG. and SIROT, MAURICE: in *Annales des Falsifications*, Year VI, No. 52, pp. 78-84. Paris, February 1913.

In the estimation of flour, analytic results, as a rule, merely confirm the judgment passed upon its quality by the miller or the baker, as a result of a trial of its bread-making qualities, or even of a simple examination. Sometimes, however, chemical analysis reveals no special characteristics in flours which are perceived by the baker to be bad. The writers have studied such cases, and have ascertained some facts of great practical importance. The estimation of soluble nitrogen, of total nitrogen, of gluten and of acidity in twenty kinds of flour of good quality has shown that the proportion of soluble nitrogen to total nitrogen varies within very narrow limits, and that, in good flours, it is always about 1 to 5.72. This proportion sinks rapidly if the flour is kapt under bad conditions and may become very low (1.15) in damaged flours.

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(1) See No. 2884, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*)

A whole series of experiments made by the witers on flours of different origin and in which they established the proportion $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$, has proved that this must be about 5.72 for the flour to be good for bread-making.

Suspicious flours which had shown on analysis too much acidity, but were considered good by the baker, have proved to vary very little as regards the normal proportion of $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$. This instance shows why the bakers prefer making bread from rather old flour with a perceptible acidity, as this does not affect the bread-making as much as has been supposed.

Flours of normal composition, but with the proportion $\frac{\text{total nitrogen}}{\text{soluble nitrogen}}$ considerably below the normal were, on the other hand, unsuitable for bread-making.

The writers record the same decrease in flours which "relâchent" (1), as well as a progressive diminution in flours which have been kept under bad conditions of preservation.

The writers conclude that:

1. In good flours the proportion of total nitrogen to soluble nitrogen is about 5.72 to 1.
2. As soon as this proportion falls below 5.2, the flour is of inferior quality and is in some way unsuited for being made into bread.
3. It seems to be a corollary that for flour to be good it is necessary that the amount of soluble nitrogen present must be in the above-mentioned proportion to the total nitrogen content, and this independently of the acidity, which is sometimes not high in bad flours.
4. The estimation of the proportion of total nitrogen to soluble nitrogen is the best method for enabling chemists to pronounce with some certainty upon the bread-making quality of the flour submitted to them for examination.

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(1) This term is applied to flour, usually made from badly harvested grain, which after kneading, and when left for a time before placing it in baskets, gives out water which rises to the surface. The baker is obliged to add more flour and re-work the dough, thus obtaining less bread and a product of inferior quality. (*Ed.*).

606 - **The Chemical Composition of Sharps and Bran.** — TANGL, F. and WEISER, S. Aus der Kgl. ungar. thierphys. Versuchsstation in Budapest. — *Die Landwirtschaftlichen Versuchs-Stationen*, Vols. LXXIX and LXXX, pp. 323-328. Berlin, 1913.

Analysis of Hungarian bran and sharps.

Average chemical percentage composition.

	Water	Ash	Crude protein	Fat	Crude fibre	Nitrogen-free extract
Sharps (15 samples).	13.00	5.98	15.30	4.50	9.45	51.77
Bran (25 samples) .	13.00	6.78	15.50	3.60	8.91	52.21

The higher fat content of sharps is characteristic and due to the presence of portions of the embryo. The pure protein and starch contents are discussed.

607 - **Researches on the Digestibility of Bread.** - NEUMANN, M. P. Mitteilung aus der Versuchsanstalt für Getreideverarbeitung, Berlin: in *Die Landwirtschaftliche Versuchs-Stationen*, Vols. LXXIX and LXXX, pp. 449-463. Berlin, 1913.

As the organoleptic properties of the Prussian soldiers' black bread («Kommissbrot») entirely compensate for its slightly inferior digestibility, the continued making of this bread is considered justifiable.

Experiments with a bread and beer diet are discussed, as also the method of determining the fatty matter in bread; for this purpose Polensk's method is recommended; or that by the writer and Kalning.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

608 - **The Establishment of a Danish Phytopathological Station for the Inspection of Plants Destined for Export to the United States.** — *Communication of the Danish Office of Correspondence with the International Institute of Agriculture.*

In accordance with a suggestion advanced by the Society of Danish Nurserymen, the Ministry of Agriculture of Denmark has approved the establishment of an official Inspection Station for living plants, in order to comply with the regulations of the "Plant Quarantine Act of 20th August 1912", which was passed by the United States for the control of the importation of living plants to that country (1).

The following are the regulations for this Inspection Station :

§ 1. — The Control Station is entitled : "The Station of the Ministry of Agriculture for the Inspection of Nursery Gardens and Nursery Garden Produce."

§ 2. — The inspection Station is under the direction of the Ministerial Adviser in Agricultural and Forest Zoology (at present Prof. Boas, Ph. D.), and the Ministerial Adviser in Plant Pathology (at present Kölpin Ravn, Ph. D.) ; the latter acts as Manager of the Inspection Station. No special remuneration is received by the Advisers for the discharge of these duties.

§ 3. For the performance of the actual control work, the Directors of the Inspection Station appoint one or more Assistants, experts in plant pathology, whose appointment must, however, be sanctioned by the Ministry of Agriculture. The Assistants are required to keep a register of all the work done at the Inspection Station, and to furnish the Director, at the close of each financial year, with a report of the inspections made in the course of the year.

The Assistants receive 20 kronen (*22s 6d*) in payment of their services, which sum according to § 7, is paid by the requirer of the certificate. In addition, they receive 10 kronen a day for their expenses during official journeys, their travelling expenses also being paid, according to § 7.

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(1) See No. 182, *B.* Feb. 1913. (*Ed.*).

§ 4. — Nursery gardeners who desire the inspection of their produce, must address to the Manager of the Inspection Station at least a fortnight before the time of the required inspection, stating when and where the latter is to take place, and the number of plants to be examined.

§ 5. — Only plants raised in Danish nurseries are inspected. The inspection takes place immediately before the packing of the consignment in question.

After August 1, 1913, only such consignments of plants can be inspected as come from nurseries which have been under supervision during the development of the plants and have been found free from injurious insects and such plant diseases as may be regarded as communicable.

Requests for inspection must be made every year to the Director of the Inspection Station, by July 1 at latest.

§ 6. — If the consignment is found to be free from injurious insects and plant diseases, a certificate to this effect is given. The certificate is signed by the Assistant who has made the examination and ratified by the Director of the Inspection Station. Two copies are made, one of which is given to the applicant, while the other is kept in the archives of the Inspection Station. The certificate is written upon a prescribed form, the text being in both Danish and English. The form is sent free of expense by the Manager of the Inspection Station.

§ 7. — The drawing up of the above-mentioned certificate costs the recipient 20 kronen. He has, in addition, to defray the expenses of any journeys undertaken by the Directors or Assistants, for the purpose of the inspection, *i. e.* 10 kronen per day for their expenses and the second class railway fare, or first class steamer fare ; he is also required to convey the officials to and from the nearest railway station or steamer landing-place.

§ 8. — The payments mentioned in § 7, are to be made to the Manager of the Inspection Station on his presenting the account. All correspondence regarding this, or other matters regarding the Inspection Station, should be directed to the Manager of the same.

§ 9. — The cost of printing the forms mentioned in § 6 is defrayed by the Association of Danish Nurserymen, which is regarded as the representative of the nursery gardens in the matter of the inspection by the Station.

§ 10. — An account of the receipts and expenditure of the Inspection Station for every financial year, as well as a report of the work during the same period, is sent by the Manager to the Ministry of Agriculture. The cost of keeping the register mentioned in § 3, as well as the postal expenses of the Manager and his assistants, are paid by the State and included in the statement of accounts furnished by the Manager.

BACTERIAL AND FUNGOID DISEASES.

ENERALITIES

609 - **Plant Diseases in Grenada 1911-1912.**- AUCHINLECK, GILBERT: in *Imperial Department of Agriculture for the West Indies, General Administration, Report on the Agricultural Department, Grenada* 1911-1912, pp. 6-7. Barbados, 1913.

Scale Insects and Black Blight. — Scale insect attacks have not so far been of serious commercial importance in Grenada, as cacao, almost the sole crop of the island, is practically free from the insects; but owing to the accompanying black blight, and in view of the likelihood of future development of citrus cultivation, their control is a matter of considerable importance.

The controls known in Grenada at present are: shield scale fungus (*Cephalosporium Lecanii*), red-headed fungus (*Sphaerostilbe coccophila*), black fungus (*Myriangium Duriaei*), scarlet ladybird (*Cycloneda sanguinea*), small black ladybird (probably *Scymnus* sp.), spotted ladybird (*Megilla maculata*), and a hymenopterous parasite (*Coccophagus?*). Of these, the first named is at present of great importance and the red-headed fungus is likely to be of much use.

Bud rot of Coco-nuts. — This has been noted on the west coast, and in districts of the northern and southern parishes; the spread of the disease has been very slow and, so far, the felling and burning of the trees has been found the safest means of control. At present, importation of coco-nuts from countries known to be infected is prohibited by law.

Root Disease. — This is due to a fungus (*Rosellinia* sp.), which attacks cacao, nutmegs, castilloa, avocados, immortels (*Erythrina* spp.), and camphor, and possibly bananas, in Grenada. Of these, castilloa and nutmegs appear the most seriously attacked. Cacao suffers only in very damp localities. The fungus has been found in every district of the island, and since castilloa is attacked immediately after planting in the forests, it is probable that the disease is naturalized in, or indigenous to, Grenada. This point, however, requires further working out.

Boll Disease of Cotton. — This is probably of bacterial origin. A continuous record of its ravages has been found from 1903 onwards. It is at present a serious obstacle to cotton-planting on the heavy lands of Grenada. The bolls are attacked just before opening, with the result that the carpels shrivel and the lint cannot arrive at maturity. Selection of disease-resistant types is probably the most satisfactory line of future work.

Thrips. — These insects (*Physopus rubrocinctus*) commit considerable ravages annually in the dry season, on cacao, causing discoloration of the pods and defoliation of the trees. The continuous defoliation sometimes leads to the death of the latter. This insect is usually associated with defective methods of tillage and draining, but it is possible that its attacks are sometimes intimately connected with exposure and lack of shade.

Thread blight and horse hair blight are two fungi occurring on nutmegs and cacao: the former is not thoroughly known, while *Marasmius equicrinis* is at present of mere botanical interest in Grenada, having only affected two or three trees.

The shield-back bug (*Nezara viridula*) is a nuisance on pigeon pear, tobacco and cowpeas in the southern drier districts of the island. A small hard-back beetle attacked cotton in 1911. The insect appeared in large numbers in October and November and fed on the bases of the petals and stamens of the flowers.

FUNGI

610 – **The Germination of the Winter Spores of *Plasmopora viticola*** (1) – RAVAZ, L. and VERGE, G.: in *Comptes rendus hebdomaires des séances de l'Académie des Sciences*, 1913, 1st Half-year, Vol. 156, No. 10 (March 10, 1913), pp. 800-802. Paris, 1913. — *Le Progrès agricole et viticole*, Year 30, No. 11, pp. 327-331, figs. Montpellier, March 16, 1913.

The writers record having observed, since 1911, in the case of thousands of zoospores, that when these are placed in suitable conditions of moisture and temperature, no rigid ramified conidiophore is formed, but a fine, sinuous, flexible mycelial thread of very variable length, which easily makes its way between the cells of the leaves of the host vine and reaches the exterior, by means of either the stomata or some slit in the leaf-tissue. The free end of the mycelium at once swells at its extremity, giving rise to a single conidium, similar in form to the summer conidium, but much larger. As soon as it is mature, the conidium separates from its stalk like the summer form, the contents divide up, and an aperture appears at the apex; through this the zoospores escape in one or two batches. The writers have counted up to 40 zoospores per conidium, but consider this is below the actual number. As soon as the zoospores have escaped from the conidium, they separate and swim rapidly in the water. These winter forms much resemble the summer zoospores in shape and structure, but are often larger and their cilia are occasionally swollen at the tips.

On placing the zoospores in a drop of water on the lower surfaces of the leaves of *Vitis vinifera*, the writers have observed, at the end of February and the beginning of March, both conidiophores and lesions due to the fungus.

They finally describe an easy method of technique to be adopted in searching for germinating zoospores; such a search might furnish useful indications for forecasting the *first* outbreak of mildew.

611 – ***Peronospora Cephalariae* sp. nov.** – VINCENS, F. Étude d'une espèce nouvelle de *Peronospora*: *Peronospora Cephalariae* nov. sp. - *Bulletin trimestriel de la Société Mycologique de France*, Vol. XXIX, Part 1, pp. 174-180, plate VI. Paris, March 1, 1913.

A description of the new species of *Peronospora* discovered in May 1909 on *Cephalaria leucantha* Schrad., and afterwards observed on two other plants of the same genus in the Toulouse Botanical Gardens. This fungus is very near *Peronospora Dipsaci* Tul., which occurs on teazel (*Dipsacus fullonum* L.), but is quite distinct from it.

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(1) See also No. 427, *B.* April 1913. (*Ed.*)

MEANS OF PREVENTION AND CONTROL

612 - **The Wetting Power of Fungicides** (1). — FONZES-DIACON, H.: in *Progrès agricole et viticole*, Year 30, No. 11, pp. 331-332. Montpellier, March 16, 1913.
VERMOREL, V. and DANTONY, E. *Ibid.* (*Édition de l'Est-Centre*), Year 34, No. 12, pp. 363-365. Montpellier, March 23, 1913.

M. Fonzes-Diacon suggests a simple method by which vine growers may ascertain whether the cupric sprays used for the control of pernospora really possess "wetting power", which, according to M. Ravaz' definition, means that instead of running off the green parts they spread on them, thus covering them with an even coating of mixture, and at the same time reaching the interior of the most compact clusters of blossoms; these latter are hardly touched by ordinary "non-wetting" fungicides. For this it is only necessary to prepare the cupric mixture by dissolving the powder to be used in a quart of ordinary water; after stirring it, a vine leaf should be dipped into the mixture. If the latter has the wetting property, the leaf, on withdrawal, is found to be covered with a uniform uninterrupted film, both surfaces being alike wetted, which would not have been the case had the leaf been dipped into water or an ordinary "non-wetting" cupric mixture. Further, when the leaf has become completely dry in the air, it will be observed that the mixture has left a continuous coating of copper compounds on all the surfaces with which it has been in contact. Experiments made with bunches of grapes, at any stage of development, should give the same results. When the vine is not in leaf, the "wetting" property of the mixture can be tested on cherry-laurel or ivy leaves.

MM. Vermorel and Dantony, on the other hand, contend that the property of the mixture can only be tested by applying it to the vegetative organs for which it is destined, and observing if these are covered with a uniform coating.

To test the "wetting" property of a mixture still better, a little methylene blue may be added; then, if the leaf is immersed and dried, and subsequently placed in a letter copying-press, a clear and faithful impression is left of the vine-leaf, showing that the treatment has been wholly sucessful.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

613 - **Rotting of Tomatoes caused by *Phytobacter lycopersicum* sp. nov.** — GROENEWEGE, F.: in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Part 2, Vol. 37, No. 1-3, pp. 16-31, 1 plate. Jena, March 8, 1913.

In the course of the summer of 1911, the Phytopathological Institute of Wageningen (Holland) received several times tomatoes attacked by a rot, which showed itself in the form of brown patches, usually corresponding to the point of insertion of the style, but sometimes occurring also on other parts of the fruit. The rot extended all round the portion first attacked and also affected the underlying tissues, in which microscopic examination revealed the presence of bacteria only.

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(1) See also No. 1236, *B*. Aug. 1912. (*Ed.*).

In the Netherlands, the disease was observed in 1904 for the first time; it was afterwards recorded in the annual reports of the Wageningen Phytopathological Station for 1906 and 1910.

But at a still earlier date this disease was recorded as occurring in the North of France (1895) by Prillieux, who considered it of bacterial origin, in North America (1896) by Earle, and in England and Denmark by Rostrup.

The writer was able to make practical reaserches in the West of Holland into the appearance, development and spread of the disease. Though not of a serious nature, it nevertheless was of frequent occurrence in the fields. He considers that there is a connection between the appearance of this disease and the prolonged cultivation of the tomato, which practice gives rise to a partial soil sickness (not to be wholly remedied by the use of fertilizers) and consequently to a decrease in the resistance of the plants to the disease.

In a greenhouse in the neighbourhood of Wageningen, where tomatoes had been grown for a long time, the rot did much injury. On replacing the old soil to a depth of 10 or 12 inches by fresh earth, the tomatoes subsequently grown succeeded well. This shows, according to the writer, that the parasite generally occurs in the soil and that the presence of the tomato plants is favourable to its development. The latter is also assisted by the practice of leaving the diseased fruits on the ground. It is therefore necessary to collect and carefully destroy all tomatoes attacked by the disease and not to use them for manure. If the soil is renewed at sufficiently short intervals, the percentage of fruit attacked is considerably reduced. When possible, it is well to turn over the soil in such a manner as to substitute a completely fresh layer for the former surface soil.

Another factor predisposing the plants to the disease is dampness; greenhouses used for tomato cultivation should therefore be suitably ventilated.

Usually the fruits which are mearest the ground are the first attacked, and the disease is limited to them, which proves, in the writer's opinion, that the infection comes from the soil.

Mr. Groenewege was able to isolate, from material sent to him from different parts of Holland, a bacterium, which he describes minutely under the name of *Phytobacter lycopersicum* sp. nov.

Infection experiments showed this bacterium to be a wound parasite. Nevertheless, the writer is not in a position to assert whether this micro-organism is the first cause of the disease, or whether, as Earle supposes, it finds way into the fruit through punctures made by small insects. He remarks that this opinion of Earle's is, at present, a mere hypothesis.

614 – **A Case of Specialized Parasitism in the *Uredineae*: *Gymnosporangium tremelloides* parasitic on the hybrid *Sorbus confusa* Gremli.** – GUINIER, PH.: in *Comptes rendus hebdomaires des Séances de la Société de Biologie*, Vol. LXXIV (1913), No. 11, pp. 648-649. Paris, March 21, 1913.

In the neighbourhood of Annecy (Haute-Savoie), the following trees are found growing together in the same coppice: *Juniperus communis* L., *Sorbus Aria* Crantz, *S. torminalis* Crantz, as well as a large number of their hybrid *S. confusa* Gremli. In 1911-1912, the writer observed that *S. Aria* was severely attacked by *Gymnosporangium tremelloides* R. Hart., *S. torminalis* was completely immune; the hybrid, on the contrary, shared almost equally the immunity of *S. torminalis* and the susceptibility of *S. Aria*, as far as this fungus was concerned. *S. confusa* offered sufficient resistance to the parasite to limit its extension and, as a rule, to prevent the normal formation of aecidia, but not enough to arrest its development. Its resistance, however, varies as regards the individual fungi, which develop simultaneously on the same leaf. The fact that only some of these produce aecidia seams to point to the existence of races more, or less, capable of overcoming the relative immunity of *S. confusa*; in the opinion of the writer, we have here the beginnings of a specialised form. M. Guinier intends continuing his observations in this direction.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

615 – ***Hyoscyamus agrestis* Kit. in Poppy Crops.** — MALZEFF, A. J.: in *Annalen der Samenprüfungsanstalt am Kaiserlichen Botanischen Garten zu St. Petersburg*, Vol. I, Part 7, 9 pp. St. Petersburg, 1912.

M. Malzeff has identified seeds of *Hyoscyamus agrestis* Kit. (1) collected in Podolia, Volimia, Kherson, Jekaterinoslav, Kharkov, Voroneshk and Kursk. It has been observed, both by himself and others, that *H. agrestis* infests the poppy crops of South and South-West Russia, as well as the fields of millet and flax in the Province of Voroneshk.

INSECT PESTS.

GENERALITIES

616 – **Injurious and Beneficial Insects of California.** — ESSIG, E. O.: *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 1 2, pp. XXXI + 351, 321 figs. Sacramento, California, January-February 1913.

A concise and practical description, for the use of Inspectors of Fruit Culture and of Horticulture, of the insects and other invertebrates of known economical importance existing in California. The writer gives a brief account of the general appearance of each species, its life-history, distribution, host plants, and the natural and artificial methods of its control. Hints follow on catching the insects, the use of collections, and the different remedies used. A list is given of the legislative enactments and administrative measures in force in California respecting the animal parasites of plants.

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(1) According to the *Index Kewensis*, *Hyoscyamus agrestis* Kit. is a synonym of *H niger* L. (*Ed.*).

MEANS OF PREVENTION AND CONTROL

617 - ***Cocobacillus Erausquinii* sp. nov. Parasitic on *Romalea miles* in Argentina.** — CULLEN, HUGO and MAGGIO, CARLOS. Descripción de un nuevo Cocobacilo Patógeno para la Langosta. — *Boletin del Ministerio de Agricultura*, Vol. XIV, No. 11-12, pp. 1368-1373, 3 figs. Buenos Aires, 1912.

A detailed description of *Cocobacillus Erausquinii* sp. nov., isolated by the writers from some diseased specimens of locusts, *Romalea miles* Drury, which they found in January 1912 in the Department of Las Colonias. There are many characters distinguishing the new species from *C. Acridiorum* F. d'Herelle.

618 - **Parasites of Insects attacking Sugar Cane.** — PERKINS, R. C. L.: *Reports of the Work of the Experiment Station of the Hawaiian Sugar Planters' Association, Entomological Series, Bulletin* No. 10, 27 pp. Honolulu, Hawaii, 1912.

This is a systematic description of different Chalcids, which are nearly all reared from the eggs of insects, parasitic on the sugar cane in America, Fiji, China and the Malay archipelago. The genera *Neotetrasticus*, *Jassidophthora* and *Eomymar* are new to science, as are also several species belonging to the genera *Ootetrastichus*, *Closterocerus*, *Westwoodella*, *Pentarthron*, *Gonatocerus* and *Polynema*.

INSECTS INJURIOUS TO VARIOUS CROPS

619 - **The Caterpillars of *Thaumetopoea (Cnethocampa) herculeana* Injurious to Low-Growing Plants in the Neighbourhood of Tunis.** COMTE, A. Chenilles nuisibles aux plantes basses. - *Revue Agricole et Viticole de l'Afrique du Nord (Algérie-Tunisie-Maroc)*, Vol. II, No. 44, pp. 33-34, 1 fig. Algiers, 1913.

The writer records the presence, in the neighbourhood of Tunis, of an enormous number of the caterpillars of *Thaumetopoea* (*Cnethocampa*) *herculeana*. These, before pupating, migrate and devour every kind of low-growing plant, whether wild or cultivated: cereals, lucerne, clovers, thistles, mustards, lettuces, spurges, docks, etc.

The writer recommends for the control of this pest, the burning of the nests of the caterpillars as soon as they are discovered, and the destruction, during winter, of weeds growing near crops.

620 - ***Phytalus smithi* and other Insects injurious to Sugar Cane in Mauritius** (2). — D'EMMEREZ DE CHARMOY, D. *Rapport sur Phytalus smithi* (*Arrow*) *et autres Scarabées s'attaquant à la Canne à sucre à l'île Maurice*, 35 pp., 8 plates, [illegible] map. Port Louis, 1912.

In the first part of his report, the writer gives a detailed description of the development and habits of *Phytalus smithi* Arrow. This insect,

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(1) See No. 750, *B.* April 1912. (*Ed.*).
(2) See No. 1587, *B.* Nov. 1912. (*Ed.*).

having been energetically controlled in 1911, thanks to the intervention of the Government, did not reappear in Mauritius the next year; nevertheless it is necessary to continue to keep a careful and systematic lookout in the district where it occurred.

Amongst the natural enemies of *Phytalus* are a minute mite (*Gamasus* sp.), and some micro-organisms which have so far not been determined. Further researches are necessary as to their efficiency in the control of the pest. Amongst insecticides should be mentioned especially petroleum emulsion with creolin or with carbolic acid.

A list and description follows of the other Scarabeids which, like *Phytalus*, live at the expense of the sugar-cane roots. These are: *Adoretus versutus*, *A. compressus*, *Serica* sp., *Oryctes tarandus*, *O. insularis*, *Oryctes* sp., *Gymnogaster buphthalma*, *Agrypnus fuscipes*, *Eutochia fullo*, *Opatrum crenatum*, *Cratopus punctum*, *Trocharocephalus strangulatus*.

In conclusion, the writer enumerates other insects attacking sugar cane in Mauritius: *a*) Lepidoptera — *Cyllo leda*, *Leucania unipuncta*, *L. loreyi*, *Sesamia nonagriodes*, *Spodopteris mauritia*, *Diatraea striatalis*, *Grapholita schistaceana*, *Alucita sacchari*; *b*) Hemiptera — *Aphis sacchari*, *Tetraneura lucifuga*, *Dactylopius calceolariae*, *Sphacrococcus bambusae*, *Chionaspis tegalensis*.

621 – ***Icerya purchasi* damaging Tangerines and Lemons in Sicily.** — DE STEFANI, PEREZ TEODOSIO: in *Bollettino del Regio Orto botanico e Giardino coloniale di Palermo*, Year XI, Part 1-2-3 (Jan.-Sept. 1912), pp. 81-82. Palermo, 1913.

The orange scale, already known from the citrus groves about Messina and Catania, has recently been observed at Bagheria. Some tangerines are already dead, and a good many young lemons are in process of dying.

622 – **Notes on the Chief Insects affecting Forest Trees in Great Britain.** — JEMMETT, C. W. *South-Eastern Agricultural College, Wye (Department of Zoology and Entomology)*, 44 pp. + figs. Ashford and London.

A description, accompanied by plates, of the chief insects (Lepidoptera, Coleoptera, Hymenoptera, and Hemiptera) which are injurious to forest trees in Great Britain and of the best methods for their control. In the appendix, the means of preventing the damage done by these insects are briefly described.

623 – **Chalcidids Injurious to Forest Tree Seeds.** — ROHWER, S. A.: in *U. S. Department of Agriculture, Bureau of Entomology, Technical Series*, No. 20, Part VI, pp. 157-163. Washington, 1913.

The Chalcidids hitherto known to be injurious to the seeds of forest trees (*Sorbus* spp., *Abies* spp., *Tsuga* spp., *Pseudotsuga* sp.) are as follows: *Syntomaspis druparum*, *Megastimus* sp., *M. brevicaudis*, *M. strobilobius*, *M. pinus*, *M. spermotrophus*. The complete life-cycle is known only for the first-named, which is also destructive to the pips of apples.

ALFREDO RUGGERI, gerente responsabile.

INTERNATIONAL INSTITUTE OF AGRICULTURE

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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of April and May 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Problem of Irrigation in the South of Italy and in Sicily

by

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The distribution of rainfall in the South of Italy and Sicily is characterized by a very low precipitation during the summer, as is the case in the whole Mediterranean region, to which those countries belong. During the summer the Adriatic slope of Apulia, Lower Basilicata, the west of Calabria and almost the whole of Sicily register a rainfall not exceeding 50 mm. (2 inches), while for the rest of the country it is between 50 and 100 mm. (2 and 4 inches). Throughout the whole region the small amount of rain that falls between April and the end of September takes the form of rare and violent showers. On the other hand, the autumn and winter months are very rainy, even cloudbursts occurring sometimes.

Owing to the summer drought, farmers must by preference keep to autumn sown crops, such as wheat and other cereals, beans, and a few other plants, when they cannot plant vines, almonds, olives and other fruit trees which are less exacting than herbaceous plant as to moisture in the soil. Sowing spring hoed plants would mean almost certain failure, and thus farming in those regions is deprived of the advantage which hoed plants bring into a rotation; the production of forage and consequently of stable manure are considerably limited, whence even now, notwithstanding the extended use of leguminous leys with chemicals, bare fallows frequently become an absolute necessity in the cultivation of cereals. The dryness of the air and of the soil sometimes cause the above fertilizers to give scanty or even negative results.

From the above it will be clearly understood of what immense advantage to farming even a small amount of irrigation water is. The possession of 6 or 8 inches, or 21 000 to 28 000 cubic feet per acre, of water signifies the success of wheat and bean crops in the frequent years in which the drought begins in spring and continues throughout the summer. It represents, further, the possibility of growing hoed crops instead of resorting to bare fallow, of getting a great deal more out of the poor permanent pastures, and of doubling the produce from grass leys. Even the vine, the olive and other fruit trees, which in some years suffer from the persistent summer drought, may be greatly benefited by a moderate irrigation, and their crop ensured.

Irrigation in southern countries, assisted as it is by the higher temperature, is much more efficient than under northern climates, and its effects are sometimes quite extraordinary. There are, for instance, irrigated market gardens in Campania which are rented at £12 10 *s* to £16 per acre, besides which all the expenses for irrigation are charged to the farmer. In Calabria and in Sicily a delivery of 13.2 gallons per minute, which is equivalent to 530 000 to 565 000 cub. ft. in six months, is sufficient for cropping 5 to 7 ½ acres, which yield up to £ 240 income from the land, whence the geologist Comm. Baldacci was justified in saying that the above amount of water represented a profit of £120 a year.

This explains also the high prices paid for water in the South of Italy, namely ½ *d*, 1*d*, up to 1 ½ *d* per cubic metre, (35 cub. ft.), while in the North of Italy the managers of the Cavour Canals sell their water during the summer at less than a twentieth of a penny per cubic metre. It is evident that in the South it is of capital importance to treasure up every drop of water flowing on the surface or hidden in the depths of the soil. In this direction a good deal has been done, but a great deal more remains to be accomplished, especially for the systematic and continuous utilization of the greater water supplies of the country, in spite of the great technical and economic difficulties due to the nature of the water courses and to the surface features.

The water courses, owing to the distribution of the rain as mentioned above, are generally of the nature of torrents: that is abundantly supplied with water during the autumn and winter, to the extent of being sometimes injurious, while in summer the amount of water conveyed sinks frequently to nothing. At the latter season only the Pescara, Sangro, Biferno and a few other rivers of the Adriatic slope of the Abruzzi convey a certain amount of water. Apulia to the south of the Ofanto river, which is also almost dry in summer, has no visible water course, not even in winter, as the rainfall disappears immediately in the subsoil through the mass of limestone fissured in all directions which is the prevailing formation in that region. On the Mediterranean slope there are important streams in Campania, such as the Garigliano, the Volturno, the Sarno and the Sele, some of which afford fairly good summer irrigation, but beyond the last of the above named rivers the features and hydrography of the country are very unfavourable to extensive irrigation works.

Indeed from the Sele to the extreme south of Italy all the country is mountainous and therefore unsuitable to the economic collection and distribution of irrigation water. Along the sea shore from Paestum to Reggio and from Reggio to Metaponto on the Ionian Sea the slopes are very short, sometimes only six or nine miles in length, so that they are cut up into an infinite number of very small catchment basins; the rainwater that falls on these is conveyed to the sea in a few days and sometines even in a few hours. The wanton deforestation begun some centuries ago, but carried out vigorously in the last century, renders this outflow of water more rapid and increases the difficulties of the problem. Sicily is in very similar conditions for the mountainous character of the country, the shortness of the slopes, and still more for the frightful bareness of the mountain sides.

Neither in Sicily nor in the South of the peninsula, are there any high mountains which keep covered with snow throughout the year or even well on into the summer, as is the case in the Alps, whose snow and ice feed the rivers of the Po valley. The greater part of the mountains of the south do not rise higher than 3300 to 5000 feet, and by the month of May they have lost all their snow.

All this renders the problem of irrigation difficult to solve, even in the level plains of the coast which would be much benefited by watering. Nevertheless, it would be unjust not to recognise that wherever possible farmers have for some time done their best to utilize the greatest quantity of irrigation water. There are a great many irrigation works; the least numerous of them are open canals of a certain importance, the greatest number consisting of systems of raising or otherwise utilizing water from the subsoil.

Some canals exist in Campania between Vesuvius and Nocera and between Salerno and Eboli. The remains of ancient works bear witness that the cities of Magna Grecia and the Romans had excavated important canals; thus those of Sybaris were considered works of considerable utility and of great beauty. It is certain that the rivers rising in the mountains of the South, which in those days were covered with forests, were richer in water than they are at present, whence it was easier to feed canals (1).

While canals are rather rare, there are great numbers of irrigations on a small scale in which the water is raised from the subsoil or from water-courses. There is no region without some of these, and Campania is specially well supplied with them in the rich belt betwen Capua and the Sele. They are numerous also in the provinces of Bari and Lecce, especially along the coast; here the water is utilized notwithstanding its relatively high brackishness. Water-raising installations of considerable magnitude are met with in Calabria in the neighbourhood of Reggio, and in the territories of Messina and Palermo. They possess steam pumping plant and raise water from wells 65 to 85 feet and more deep. Sicily has besides an admirable system of irrigation with water from the Simetus in the plain of Catania and in the plain of Terranova on the south coast.

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(1) At Venafro in the upper Volturno valley a tablet was discovered, the so-called "Aquarian Table" which was the regulation for the use, by an association, of the irrigation water derived from that river. Lenormant, in his works *La Grande Grèce* and *A travers l'Apulie et la Lucanie*, cites texts and inscriptions, and mentions remains which prove the existence of canals and irrigation at the time of the Greek colonies in Southern Italy.

Angelo Mosso, in his work *Vita Moderna degli Italiani*, describes the ancient water works of Syracuse, where at present there is hardly water enough for drinking purposes, and comes to the conclusion that Syracuse, owing to the neighbouring mountains being covered by forests, had then more water than the best supplied large cities of the present time.

The machinery with which water is raised consists mostly of norias, water wheels with chains of buckets of primitive construction, often with wooden gearing and esparto ropes, with which often barely one third of the animal power employed is utilized. Where the water is not far below the surface of the ground see-saw buckets are used, or winches with leather or wooden buckets which remind one of the systems used by the Arabs along the Nile. Recently, especially in the neighbourhood of Naples, pumps with electric motors have been introduced; they permit the economic utilization of water from wells which would be too deep for the usual norias.

With the above means, raising water is always a very costly process; the best norias over wells 16,33 or 40 feet deep supply water at about 1¼ *d*, 2½ *d* or 3 *d* per 100 cubic feet. At the same prices water is sold in the neighbourhood of Palermo by large steam pumping installations; in the territory of Messina, where the ingenious system of underground dams and filtering galleries prevails, the price reaches 4 ½ *d* per 100 cub. ft.

In that district, as in Calabria, the mountain slopes are very short and steep and the torrents which descend along them have excavated very deep beds in the prevailing crystalline rocks. These beds have since been partly filled up with coarse and incoherent material carried down by the water, which even when it is perennial percolates through the loose material and flows hidden from sight on the bed-rock under the rubble. Long ago the farmers learned to dam these underground streams by means of barrages resting on the bed-rock, which cause the water to rise against them and to flow into galleries exacavated just above the base of the dam and provided with apertures to receive the water. These galleries lead first to underground conduits and then to open channels which convey the water to irrigate the soil; thus even steep slopes, which have been turned at great expense into terraces sustained by the usual masonry or dry stone walls, can receive irrigation.

Such works are to be found in Calabria about Reggio, in the district of Palermo and in other parts of Sicily. Many of them are of recent construction in spite of their heavy cost, which does not allow them to supply water at less than 3 *d* or 4 ½ *d* per 100 cub. ft. Several of these works supply drinking water to inhabited centres.

From the foregoing it is seen that in the provinces of Southern Italy and of the islands there is a great prevalence of small and very small irrigation works, the greater proportion of which raise water from the subsoil at a price that only the high productivity of the irrigated crops allows to be paid without working at a loss.

The State has always endeavoured to further irrigation throughout the whole country, but it has bestowed most care on the valley of the Po, which possesses in the installations of Piedmont and of Lombardy examples of irrigation works unique in the world. Several causes favoured the spread of irrigation in those provinces, especially the facility with which associations of landowners were formed for the construction of the minor works intended to receive the water from the main canals excavated by the previous Governments and by the present one. Considering the benefits which these associations had conferred upon that part of the country for centuries, it was thought advisable to favour the constitution of similar associations in the South of Italy, but the attempt failed completely on account of the lack of tradition of such organizations and of the habit of free initiative.

Laws on the matter were enacted in 1873 and 1886, while the law of 1882 promoted associations for reclaiming lands. Irrigation associations receive yearly subsidies amounting respectively to 3, 2 and 1 per cent. of the capital spent during the 1st, 2nd and 3rd decade from the execution of the work. These grants were, however, subordinate to the condition that at least 106 cub. ft. of water per second should be conveyed. With quantities of water not inferior to 10.6 cub. ft. and in exceptional cases to 2.6 cub. ft., this subsidy was reduced to two-thirds of the above. Thus the south of Italy and the islands, in which small irrigation works necessarily prevail, were excluded from the benefits of the law, and notwithstanding all the fiscal concessions offered to new associations, it was not possible to constitute a single one, though here and there good private initiative was not wanting.

The State realized then that a different plan should be followed, and that in the first place it was necessary, in order to provide the greater part of the South of Italy and the islands with water, to study the possibility of storing the surplus winter water of the rivers by means of dams. Hence in 1884 for some of the rivers preliminary surveys were made with the intention of enacting new laws in the matter. Financial difficulties, however, did not allow the realisation of these projects, and it was only by the law of August 2, 1897, for Sardinia that funds were voted for the creation of artificial reservoirs; some of these are in course of construction. (1).

At the same time the Ministry of Agriculture began collecting materials for the study of the hydrography of Italy. A special office was opened for the purpose, at first under the management of Sig. Zoppi, C. E., and now of Cav. E. Perrone. It published the hydrographical map of the kingdom, in which the most important features are shown (catchment basins, volumes of streams, water works, canals, irrigated and irrigable lands, etc.). An abundant series of memoirs accompanies this map and contains the results of the investigations of the office on the measurement of the volumes of streams, and on the hydrographical and irrigation condition of the various regions. These memoirs have been, and still are, very useful to those persons who intend to divert water for agricultural or industrial purposes.

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(1) Whilst this is in the press the Government has presented to Parliament a bill for the construction of artificial reservoirs in Sardinia and Calabria, with the object of supplying water for irrigation and for motive power.

For the solution of the irrigation problem, what was still wanting was a complete review of all the water resources of the country and of the means and convenience of utilizing them. In 1910 therefore, on the proposal of the Parliamentary Commission of Enquiry into the conditions of the peasantry in the South of Italy and Sicily, a special law was passed for the appointment of a Royal Commission — to which the writer belongs — to study the subject. It was agreed that the Commission should begin its work in Apulia, where disastrous droughts are frequent. One of the most memorable ones was that of 1908, during which drinking water had to be conveyed by railway.

The above-mentioned Commission, under the presidency of Count Guisso, began immediately to enquire into the hydrographical conditions of the three provinces of Apulia (Foggia, Bari and Lecce), taking stock of their water resources, both latent and visible, and commencing to examine the question of reservoirs for that region. A few months after its appointment on June 30, 1911, the Commission presented its first report to Parliament; in this, after a general review of the problem of irrigation in the South of Italy, it communicated the results of the first enquiries made in Apulia by a special committee and its opinion on the feasibility of constructing reservoirs. The committee had visited the valleys of the Ofanto, of some of its tributaries, of the Fortore and the principal coast sources of the province of Lecce (« heel of Italy »), and had come to the conclusion that extensive irrigation was possible. The report discussed also the possibility of making use of the surplus water of the Apulian aqueduct, which, starting from the sources of the Sele on the Mediterranean slope, conveys through 112 miles of main covered aqueduct the water that the inhabitants of Apulia require. When the regular distribution of this water is made, the waste and sewage water from the inhabited centres will also be available for irrigating and fertilizing. This very complex problem has also been studied by a special commission appointed by the Ministry of Public Works. (2).

The Royal Commission proposed to the Minister to present a new law authorising the State to grant up to six-tenths of the cost of the work required by the small irrigation schemes of Southern and Central Italy which were debarred from availing themselves of the law of 1886. The Minister of Agriculture, Prof. Nitti, has recently renewed the assurance that he would present a bill on the subject, the conditions of the country not having permitted it to be done before now.

The commission will shortly present a second report, now being printed, containing detailed reports on the following subjects :

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(2) Unfortunately, little or nothing has been done in this direction in the South of Italy. The city of Naples itself, which has constructed a splendid system of sewers at the cost of upwards of \$800 000, allows 11.8 cub. ft. per second of sewage water collected by the above system to run to waste into the sea, below Cuma, instead of using it for the benefit of the adjoining country.

1). Construction of a large reservoir on the Fortore river in the province of Foggia for the storage of about 7 000 000 000 cub. ft. of water for the irrigation of 100 to 125 thousand acres of the plain of Apulia between Mount Gargano and the Apennines. The extent of land benefited by the irrigation might even attain 173 000 acres with the help of a derivation into the basin of the Biferno by means of a tunnel through the hills which separate the two valleys.

2). Examination of other proposed reservoirs on the Locone and Rendina, tributaries of the Ofanto, and on some rivers of the Basilicata.

3). Study of the problem of raising water from the coast sources of the Lecce district for the irrigation of the higher-lying plateaus.

4). Report on experiments on the use of brackish water (containing almost 7 per 1000) in irrigation, conducted by Prof. Celso Ulpiani of the Higher School of Agriculture at Portici and by the writer. The experiments are being continued.

5). Report on the work done in Liguria by a special commission, on minor matters and on the programme for the next years.

In the latter is included an examination of the conditions of the districts most in need of water for irrigation, among which Sicily receives special attention; in it detailed investigations will be made.

Thus the problem of irrigation in the South of Italy seems to be about to be solved in the best way that the conditions of soil and of climate allow.

Lastly, irrigation in the southern districts may find much assistance by a wide use of the so-called "serbatoi a corona". These are artificial reservoirs for rainwater or for the water of temporary streams, made by enclosing a semicircular space at the base of the hills or in the hollows between them by embankments not exceeding 33 to 40 ft. in height. Thus about 3 500 000 to 7 000 000 cub. ft. of water, and exceptionally 17 500 000 cub. ft., can be stored; at the rate of 56 000 to 70 000 cub. ft. per acre this allows fairly large extents of land to be irrigated. The provinces of Parma and Piacenza possess a good number of such reservoirs at the foot of the hills along the Apennines, where the prevailing clay formations supply an excellent material for the embankments. The Hon. Raineri, as President of the "Federazione Italiana dei Consorzi Agrari" (Italian Federation of Agricultural Cooperative Associations), has published a work on such reservoirs constructed in that region up to 1904, which may be consulted to advantage by those who wish to have a clear idea of an easy and economic way of storing water for irrigation.

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Every region has a considerable number of pamphlets on the subject of its hydrography and irrigation schemes.

The Swedish Institute for the Improvement of Field Crops at Svalöf

by

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The foundation of the Svalöf Station was due entirely to private initiative, in fact to the farmers themselves. Its aim was to supply Swedish agriculture with improved and new seed. The realization and development of the original project have up to the present remained under agricultural direction, though the bulk of the necessary funds is now supplied by the public.

The natural consequence has been that the first and sole object of the undertaking is to achieve practical results. For this reason, it has only been in special cases that scientific experiments have been carried out, and then only on subjects directly connected with questions of practice. All the same, it was happily seen from the beginning that only expert botanists could direct the variation and genesis of new forms into the required channels, that is to say lead them up to the creation of real cultural varieties adapted to their country and of high yielding capacity. It was also understood that the work must be strictly specialised, and concentrated on this one point: such subjects as teaching, comparative trials, and commercial analyses, which are often such a severe burden on the programme and staff of Experiment Stations elsewhere, were foreign to this particular line, and must be set aside.

It is to this free organization, to the carefully adapted programme, to the intimate contact with farming practice and farmers, combined with the use of the best methods and resources of Science, that one must look for the explanation of the fact that a humble provincial institution of such a comparatively poor country as Sweden, with a rather unfavourable climate, has been able to contribute to the reorganization and development of the improvement of cultivated plants to such a remarkable extent as the results of the last quarter of a century show. Another cause of success is undoubtedly its purely agricultural organization.

The question of seed supply had already been long prominent among Swedish farmers when M. B. Welinder, a young landowner at Svalöf, assisted by Baron Gyllenkrook and various other farmers in the province, founded in 1886 a local society for seed improvement. In a short time it excited so much interest throughout the country that it rapidly extended to form the Society for the Improvement of Agricultural Plants in Sweden ("Sveriges Utsädesförening"). One after another, all the Swedish Agricultural Associations, even the most northerly ones, sent in subscriptions, and lastly the State also made a grant. At the same time some thousand members from all over the country gave their financial and moral support.

The undertaking was annexed to a free association of farmers, so as to have their direct interest in the work going on, as well as their regular subscriptions. There are two classes of members: life members, who pay about £5 11*s* once for all; and annual members, who pay 5*s* 6*d* a year. A committee of seven members — farmers and others — acts as executive, finance committee, etc.; three of these are elected by the Society itself, three by the delegates of the Agricultural Associations who form a consulting council, and one by the State. The Society publishes a periodical Review, as well as special leaflets as required. By giving advice, making expert judgments, directing local comparative trials and special seed shows, examining local varieties, and other such work, the Society endeavours to carry out as far as possible the task which it has set itself, namely of bringing about a general improvement in the growing of crops in the country.

The funds required for carrying on the work come from various sources The members' annual subscriptions give an average of about £147; the Agricultural Associations have given about £885 a year, latterly rather more; the State gave £833 a year from 1890 to 1905, and since then has given £2 222. At present, there is a proposal under consideration for raising the State grant to £4 444; this would include the subscriptions from the Agricultural Associations, who would withdraw their support. The sale of new varieties (which will be referred to later) has brought in to the Society a steadily increasing profit; in the period 1901-06 it averaged nearly £290 a year, and has now reached £2 440. Thus the income of the Society for 1913 is about £6 000. Out of the subscriptions of the life members (totalling some £2 000), a fund was set apart for buildings; these were also liberally endowed by friends of agriculture, showing what great interest has been aroused by the undertaking: the total endowment is now £15 275.

The Society has now a large and well-equipped establishment, comprising two buildings for laboratories, a building for seed preparation, a small farm and a dwelling-house. The land is 40 acres, of which 25 are reserved for special plots and for increasing the seed-supply. All the same, it has been found necessary to grow the greater number of the trial crops — the real experimental plots — on the large estate adjoining, so as to give the various cereals (together occupying 30 acres) their proper place in the rotation; this has been found absolutely essential for normal development.

History of the development of the methods of work. — The starting-point of the work was naturally methodical selection, which was accepted and adopted everywhere at that time, in accordance with Darwin's theory, still considered capable of resolving the problem of the formation of species in nature. A treatise on these ideas, characteristic of the epoch, was published by K. Rümker in Berlin in 1889, under the title of "*Getreidezüchtung*"; this was considered from 1890 to 1910 as a classical summary of the experiments on the improvement of agricultural plants. It must suffice to say that it was believed that the continued and methodical selection of plants showing some common quality or tendency, would lead to the creation of a new and constant form containing this desired quality as a distinctive and hereditary character.

It was not till ten years later that a serious criticism of these ideas was made by Hugo de Vries in his work "*Die Mutationstheorie*" (1st. Ed., Leipzig, 1901); he threw considerable doubt on the view that the advances already made in plant improvement had been really obtained by this means, and illustrated its insufficiency from theoretical considerations as well as by reference to his own experiments. It so happened that the new method of work which he wished to substitute for the old had already been carried out at Svalöf for ten years; this was shown by the hundreds of truly new varieties produced there by the new method. Let us now go into the details of this development at Svalöf.

It was not without careful criticism that Von Neergaard, the first scientific director of Svalöf, based his work on methodical selection. In particular, he endeavoured to simplify and bring under more natural agricultural conditions the growing of the trial crops, which had previously been given forcing treatment; also to replace approximate estimation of the qualities of the plants by numerical determinations of weight, bulk, number and size. For this purpose he invented several new instruments and introduced new methods of research. In this way it became possible to control the ultimate variations and their relative stability. Methodical selection was thus made the subject of scientific criticism for the first time.

In 1890, when I took over the direction of the work, I had to get out as soon as possible a general summary of the observations for the subscribers. In spite of the extent and intensity of the later selection work, this report did not show the results which we had considered we could expect. Five years of rigorous and continuous selection had given only a relative uniformity, and no distinctive or stable new variety character could be reported. But the most obvious thing was that "élite" varieties, when left to themselves for a year or two, fell back into the mixed condition of the original varieties. The demand of Swedish farmers for better, and above all stable, varieties could evidently not be met in this way. The only course was to look for another method, based on firmer scientific foundations. This was the rather hopeless state of affairs at the beginning of 1891.

By the summer of 1893, however, the difficulties had already been overcome; by then a new method was in practice at Svalöf, promising the certain accomplishment of the aims which the Society had set itself. In my second year at Svalöf (1889), my botanical instinct had led me to pay careful attention to all sorts of curious forms which occurred among the old cultivated varieties. Would it not be possible, I thought to myself, to produce by growing these, new varieties as good as those at which the slow and systematic improvement of the original varieties was aiming?

The work was begun forthwith. Preparatory experiments in 1890 with 30 different types of spring wheat and vetches, continued the following year with 291 types, gave unsatisfactory results; so in 1892 I brought the number up to 1 900, comprising all the crops then under investigation: wheat, barley, oats, peas and vetches. At first the result seemed rather discouraging, but all the same I observed here and there certain winter wheats which at once opened to me fresh perspectives. Although only about 5 per cent. of the total number, they showed characteristic and uniform types, different from anything we had seen in our crops; it was evident that their value was utterly different from that of the rest. On referring to the registers of the origin, treatment, etc., of the seed with which these plots had been sown, we saw that each of these plots had come from a single ear, or (what comes to the same thing) from a single plant. This directed our attention to the importance of the individual in improvement work. This was for us quite a new idea, and from the scientific point of view inspired us with eager hopes.

To get a definite solution of the question, we made a general field trial, in 1893, of separate plots derived from characteristic individuals (2 000 different numbers). The result was most convincing; it left no doubt that the only true point of departure for fixing the types found in the previous work would be the individual plant, and also that the only unit to be reckoned with would be the complete living plant, not (as had been considered previously) its parts, such as ear, spikelet, grain, to which different hereditary tendencies had been attributed.

The Svalöf improvement method. — On this new basis, the problem of improvement bears a completely fresh aspect, and one gets glimpses (we did not realize it at all at the time) of a long perspective of work along this line. We had confirmation of this as soon as the work had been carried on on the new principle for a short time.

Firstly we succeeded in showing that most of our material contained a host of independent forms, with highly divergent qualities and very varied value in farming practice. By separate culture starting from a single plant (pedigree culture), which is very easy to control, we also found that the majority of these forms were stable, only rare cases of segregation, like the results of crosses, occurring. Thus, instead of being unable to produce a single truly stable form, we can now create any number of new and constant varieties suitable for growing.

Following the old selection in mass and the methodical line of work was really equivalent to depending on chance, so that no-one knew how or when uniformity, of such paramount importance, would be reached, or even if it would ever be reached at all. But starting, as we do now, with pedigree cultures, all fear of being held up by insurmountable variability is avoided. The varieties are already in existence and fixed at the beginning of the work; the difficulty remaining is to learn to know them and appreciate their value properly. Thus the chief and only decisive work does not come till after the fixation of the already existing variety.

The long series of selection operations which previously had to be made year after year on thousands of plants and their various parts (the whole plant, different culms and ears, spikelets and individual grains) has become superfluous now that the whole plant is the unit dealt with, in comparison with all the other individuals of the same generation. The various instruments, which were till then necessary in the research work, have been set aside as museum objects, to be used at most for certain control examinations (1). Instead, the experiment field has become the centre of the estimation work.

Pedigree culture has, however, been of only secondary importance in the work at Svalöf; it has been used as a preparatory and practicable auxiliary for the classification of the material to be used. The chief interest, as well as the fundamental work, is concerned with the subsequent examination of these innumerable fixed minor species, to find what characters they contain which are of importance in practice.

The decisive characters in each species occur in enormous numbers, and in the allied forms present an extraordinarily abundant series of combinations ; for this reason the comparative estimation becomes a very difficult matter, especially seeing the work must start from as large and varied a series of forms as possible, so as to have the best chance of finding the best. Since the date mentioned, the greater part of the work at Svalöf has been devoted to these problems.

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(1) The followers of the Svalöf method in other countries do not seem yet to have reached these consequences of individual improvement, a fact which should be noted.

A beginning was made by dividing the work among the different competent members of the staff, each one taking over a section confined to one or two species. Then, by making a careful study of his own material, with rigorous investigation and field trials, each member came to perfect himself in his special branch, and trained his eye firstly to distinguish the different forms and secondly to judge the relative value of the characters existing.

The fact that we have generally been able to draw up natural classifications, in which strictly morphological characters indicate the absence or presence of certain properties determing the practical value, has been an inestimable advantage. This allows us, even in the first search for parent plants, to advance a little in some desired direction.

For the final and only decisive estimation, namely that of the agricultural value, it has been necessary to have recourse to field trials. The fact that our Institute, owing to its intimate relation with farmers, has wholly agricultural organization and equipment, has been a great help. The *practical value* of the hereditary qualities of the numerous new forms has been determined at Svalöf exclusively by growing the descendants of élite parent plants under field conditions. To arrive at this practical value normally requires cultivation and severe criticism carried out over a long series of years.

Naturally many practical arrangements have been required in carrying out all these processes with the exactness and order indispensable in dealing with material comprising thousands of forms each year (in 1912 there were over 9 500 numbers on the trial plots). Special geneaological tables (suitable for the classification of fixed species) were drawn up, with numbers referring to parallel geneaological collections, as well as to the trial plots, the registers and the tables.

The order of work was fixed in its general lines in a few years ; thus it was shown for the first time at the General Swedish Agricultural Show in 1896, by several hundred new and stable varieties, already compared with one another.

By the great variety of constant forms thus shown to exist in our material, the improvement of field crops was built on a much wider basis than with the old method, which could only deal with a few specially good varieties. The possibility of producing valuable novelties was thereby greatly increased, as the available characters were very diverse, comprising also date of ripening, resistance to winter and to diseases, etc., all qualities of great practical value, but previously beyond the reach of improvement work.

These forms, regarded as agricultural varieties, are of a stability which considerably prolongs and widens their use, as they do not need frequent renewal by the purchase of fresh seed. Their stability embraces a number of characters and qualities whose transmission could not be reckoned on before. As this stability affects all the plants, at any rate in the first few generations, the hereditary peculiarities become more obvious in the variety in question than in others, a circumstance which greatly facilitates estimation and control.

We may now enquire into the nature of all these minor species which have allowed the division of the old material into new and independent forms. Do they come from mutations, or from spontaneous crosses, or from both together? That mutations appear from time to time in our crops has been observed also at Svalöf. Further, it has been found that spontaneous cross-fertilization is much more frequent than was imagined. But it must not be supposed that the origin of the forms can be ascertained for certain in every case: indeed, this hardly matters for practical work, as for this it is enough to know that these forms exist. In any case it should be noted that the final results of these two different types of origin are of the same nature, in that they induce in each group of forms a multitude of systematic units, distinguished among themselves chiefly by the varying combinations of a certain, and often very small, number of characters. They are all what have been termed "minor species", or "elementary species". M. Johannsen, who later made a thorough study of them, refers to them as "pure lines"; here we have, for practical reasons, kept to the English word "pedigree."

Although our first experiments on this subject dealt with autogamous species (wheat, barley, oats, peas, vetches), our later experience with rye, clover, forage grasses, beets, etc., brought us to the conclusion that in allogamous plants there exist analogous independent minor species. In these plants, however, they naturally do not show uniformity immediately they are isolated. They require systematic treatment for several years before they acquire a satisfactory degree of purity and stability, and this can never be as perfect as in autogamous species. But it has already been shown that these forms can be used to bring about the same practical results as the others. The extension now in progress at Svalöf is chiefly intended to give scope for more intensive treatment of these groups, by fixation of varieties and practical testing.

Crossing work at Svalöf. — Another means of producing new forms of field crops is artificial crossing. About 1895 we were so much occupied with testing the value of all the forms obtained by the examination of the old varieties that we had no chance of taking up this question seriously. The extensive crossing experiments which we made a few years later did not give encouraging results. All the same, the winter wheat Svalöf Extra Squarehead II, eventually so famous, came from this first series of crosses.

As we accumulated rich assortments of well tried new varieties, characteristic and stable, each with some special quality of practical value, it was natural that we should try to establish other and better combinations of these qualities by systematic and careful crossing. This was undertaken from 1900 on.

Since Mendel's researches, of such fundamental importance for crossing in general, have come to light, the work in this direction at Svalöf has been greatly enlarged. In particular, Dr. Nilsson-Ehle's researches on wheat and oats have furnished remarkable contributions to the study of phenomena of this nature. The new light furnished on these problems of variation and heredity has been of considerable value for the improvement. It seems that at last Sweden is in a position to produce agricultural material for use in more nothern latitudes; such varieties will combine general good qualities with strong winter-resistance or marked rapidity of ripening.

Further, the application of this method, which has been very much used at Svalöf, has shown that the combination and segregation of qualities among the products of crosses is normally so complicated as to render very illusory the idea of reaching good results by theoretical speculations. But this is a difficulty that must be put up with, as crossing offers so many chances, even if they are rather vague, of results which cannot be had in any other way.

In any case, the crossing which we do at Svalöf with our already fixed varieties, is to be considered primarily as a supplement to the older method, not as a substitute for it. All crossing work demands as a starting point pure and stable material of well-known properties, so that the first thing is to prepare such material. In the same way the subsequent development of the process of crossing depends on the continuous creation of new and better material. Consequently, for the production of the two groups of material required, our method must be used, as it is the best and most effective for seeking out the most valuable and constant types in the old mixed varieties. It should also be remarked that selection among the highly variable descendants of a cross is practically exactly like the old Svalöf method.

For a large and important part of the material dealt with, such as forage and root crops, the time for crossing is still in the distant future.

Extent and successive development of the work. — The crops dealt with at Svalöf from the beginning are winter and spring wheat, rye, barley, and oats; peas and vetches were started in 1889. Oats, however, were not subjected to very intensive work till the adoption of the new method in 1893, and rye not till 1900. It is true that the programme included the other agricultural plants, but no attention was given to these till further funds were forthcoming; it was thus not till 1905, when the Government allotted $1400, that it was possible to begin work on forage grasses, clover and potatoes. Root crops will not receive systematic improvement on the Svalöf method till after the coming rearrangement of the finances to which we have already referred. It is true that some work has already been done on them, but only by the simplest pedigree method, with selection in bulk. The time is now approaching when all agricultural plants will be dealt with by our Institute.

As mentioned above, the intensive study of details which the new method involved, led to a distribution of the material in which each specialist received a separate section of work. Thus oats and wheat were undertaken by me from 1890 to 1910, and since then have been under the charge of Dr. H. Nilsson-Ehle. Barley was under M. P. Bolin from 1892 to 1896; he was succeeded by Dr. H. Tédin, who has also had charge of the leguminous plants since 1892. M. J. Walldén had rye from 1901 to 1904; then he was joined by M. E. Ljung, who has had sole charge since 1908. M. Fr. Lundberg has had potatoes since 1905; forage crops were taken by me in 1904, but in 1907 were handed over to Dr. H. Witte, who at the same time undertook clover; root crops have been under M. J. Karlsson and others since 1907. M. Walldén has directed the work of control and germination testing since 1892.

It is evident that the final results of our work can be of practical value only under conditions similar to those in which it was undertaken, and should not be expected to be of value for very different soils and climates. In a country of the size of Sweden, which extends over 13° 40' of latitude, that is to say a north-and-south distance as great as from the south coast of Sweden to Rome, it is evident that this rule necessitates a series of trial crops in the different parts of the country. After producing at our Institute, situated in Southern Sweden, a good many varieties believed to be suitable for the centre of the country, we had every year to establish a number of such local trials. We soon found it necessary to have special branch stations, so as to undertake more detailed research, and to ensure proper control of the distant trials. We already have two such stations: one established in 1894 in Central Sweden (near Upsala), and the other near the Arctic Circle at Lulea; the latter is especially concerned with forage crops. Owing to the present state of the work, we are intending to establish several more in the more important agricultural provinces.

Commercial collaboration. — Most of the men who had founded the Experiment Station, joined in 1891 to form the Swedish General Seed Company; this organization undertakes to look after the new varieties belonging to the Society as they are produced, and to increase them and put them on the market, the whole being under the supervision and control of the Society. This commercial enterprise was at the outset confronted by many difficulties. But since the beginning of the present century, with the increase in number of the new varieties, it has shown continuous growth in importance and extent, so that it now has a very firm foothold and is a great help to the parent institution.

There are thus really two distinct organizations at Svalöf, completing one another perfectly in the work for the common end. This is why they are often confused abroad under the general name of Svalöf Institute, though they are perfectly distinct in both administration and finance. The Company has purchased an estate next the Society's land, containing some 1500 acres of first class fields, where most of the field trials of the Society are carried out. There are also special stores built on this property. The Company also possesses two well-equipped branches in Central Sweden.

The detailed distribution of the work and the contracts between the two organizations were approved by the Government in 1909, and are under its supervision. According to this arrangement the Company takes the new varieties as soon as they are ready, generally in amounts of only some 220 lbs.; they are then increased on the land already mentioned, under the direction of the specialists. The subsequent crops on a large scale, which naturally have to be carried out on the farms of proprietors in the different provinces, are also under the same expert inspection.

Not only the small élite progeny, but also the larger crops, are examined and approved by the Society when sent to the store; the Society also directs the cleaning and sorting, makes an exact analysis of each lot, puts its seal on the sacks and sees to the final dispatching, so that the purchaser receives each lot with a sufficient guarantee of its quality.

The varieties already handed over to the Company remain under the observation of the Society, so that new lines, fresh blood in fact, may be introduced into the Company's strains as soon as required. In this way the Society remains always responsible for the purity of the varieties on sale.

In return for these privileges the Society receives from the Company a certain annual sum, at present exceeding £2 200. Further the Company has, under certain conditions, to hand over to the Society part of the surplus profit. As the members receive only a limited dividend, it may be said that the Company also works exclusively for the public interest.

Svalof products abroad. — It is evident that varieties selected and valued under a climate as northern and distinctive as ours can only be used to a very limited extent in countries with very different climates. But taking into account only the part of Europe north of the Alps, and leaving out the extremely continental climate of Central Russia and parts of Austria and Hungary, it seems that a good number of our varieties are suited to the conditions of other countries. Indeed they have already spread over no inconsiderable area. It has happened that certain early ripening varieties, such as Hannschen barley and Culdregn oats, have unexpectedly adapted themselves to very extreme conditions. Thus, to give a few examples, the new varieties of oats are much grown and appreciated especially in Russia. Most of our varieties are much grown in Germany, Denmark and Holland, and in the last few years have been taken up in England. In France the malting barleys are especially appreciated, but also the oats. In Canada and the United States a good many varieties are grown, but all limited to certain special regions. Further, isolated trials have been made almost all over the civilised world, under the most diverse conditions, with very varying results, as was foreseen.

Improvement of Wheat and Oats at Svalöf

by

H. NILSSON-EHLE.

Since 1900 the writer of this paper has been conducting the work of plant breeding in the Wheat and Oats Section at Svalöf; he has published a series of memoirs and notes, some theoretical, others practical, on the subject. In the "*Beitrage zur Pflanzenzucht III*" the writer gives a resumé of his work on winter wheat. A similar summary, in German, of the work accomplished on oats, with complete bibliography, is in course of preparation.

The present article proposes to give the most important results of all this work. The chief object aimed at during these twelve years has been to provide farmers with improved varieties. Secondarily, so far as time permitted, an endeavour has been made to develop further the principles and methods of practical breeding, by giving in a series of publications, partly of a purely theoretical nature, information on the bases of breeding, variation and heredity.

Practical breeding has resulted in a series of new varieties which have been handed over to practical farming, but only such varieties were distributed which in practical experiments yielded a heavier crop than those previously grown or otherwise revealed themselves superior.

These improved varieties were selected only according to yield and to direct valuation of their good qualities, and *not* according to an indirect opinion based upon a supposed correlation. An increase in the number of varieties grown in Sweden was vigorously avoided: the new varieties were so distributed as to replace the varieties previously grown, and no greater number of varieties were produced than those required by the very various climatic and other conditions obtaining in Sweden. The most important new varieties launched between 1900 and 1912 are: among winter wheats, *Extra Squarehead II* (1909) (1) and *Sun wheat* (1911) for the South of Sweden, and *Poodle wheat* for Central Sweden; among oats *Conqueror* (1908) for the white oat districts of the South of Sweden and *Black Bell II* (1909) for the black oat districts of Central Sweden. All these varieties spread widely during the succeeding years, not only in Sweden, but to a certain extent in neighbouring countries also, and have retained their position in practical farming. Besides the above, some few varieties adapted to more special conditions were distributed (*Fyris* oats and others).

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(1) The date in brackets is that of the year in which the varieties were first placed upon the market and mostly in great quantities.

The new varieties have replaced the older ones : Extra-Squarehead II has completely replaced Extra-Squarehead I, the yield of which was considerably inferior (about 15 per cent) ; the Grenadier variety is also destined to disappear gradually. As for oats, the varieties Hvitling and White Probsteier, as well as Black Bell I formerly bred at Svalöf, have been withdrawn and they are no longer sold at Svalöf. Thus an increase in the number of varieties has not taken place. A few other varieties whrich show further improvement in certain directions have been given out to be grown on a large scale and will within a very few years be placed on the market ; thus among oats, Crown and an early cross for the North of Sweden, and among wheats a very productive cross for South Sweden (0801) and Thule for Central Sweden. The multiplication of the most recent crosses, which represent the highest mark at present attained in improvement, is being carried out.

The above new varieties have been obtained partly by selection from native cereals and partly — during the last few years principally — by crossing. By mutation, on the other hand, no new improved variety has been obtained. The artificial crosses were made with the object of combining in the best manner the principal valuable qualities, such as resistance to cold, lodging and diseases, productivity, and the like, and at the same time of increasing these qualities in the desired direction. In the attainment of these aims continual progress has been made.

The work concerning the theoretical basis of breeding referred especially to the nature of the hereditary variation in cereals and to the manner in which several qualities, especially those of practical importance, are inherited. With this object the writer began in 1900, the year in which the great discoveries of Mendel were known, comprehensive experiments in crossing; the results have hitherto been only partially published in the two principal works of the years 1909 and 1910, as well as in a series of shorter papers.

The first result of these researches agreed with those of Von Tschermak, Biffen, Spillman, De Vilmorin, Howard and others, namely that all the qualities of cereals, after crossing, show a sure segregation and reciprocal independence and form all kinds of combinations. The so-called " elementary species, " " constant forms, " " pure lines " of the mostly self-pollinating cereals are not, as De Vries thinks, independent unities obtained by progressive mutations, but various *homozygotic combinations* of segregating qualities. The crossing of two constant forms may give rise to an immense variety of new forms which may be maintained constant ; it suffices thus to have only *one* such cross to render manifest all the diversity of constant forms or lines of a native breed. In other words, by the crossing of only two constant forms, a whole " population " of new forms and lines is obtained. As spontaneous crossing occurs frequently in self-pollinating cereals the nature of the so-called elementary species or lines as combinations of crosses becomes quite clear.

This fact being recognized, artificial crossing became naturally a specially important principle in breeding. The object of breding was no longer limited to the selection of the existing homozygotic combinations, but was extended to the obtaining of always better combinations by appropriate crossing; and in this connection not only the crosses between older and more different varieties, but also between lines, partly of the same old breeds.-

As for the magnitude of the differences between the homozygotic combinations (" genotypes " of Johannsen), it was shown in connection with researches on the variation of native breeds (*Sveriges Utsädesförenings Tidskrift*, 1901, pp. 154-176; 1908, pp. 165-170; *Botan. Notiser*, 1907, pp. 113-140), as well as upon the segregation of qualities after crossing, that in respect of most qualities, especially of the practically important ones, the genotypes are so numerous and so closely connected that they form fully continuous lines; the result is that by cultivating separately plants of similar aspect, an apparently uniform group of individuals can be split up into different descendants, into lines hereditarily different. Among the genotypes one may, it is true, isolate well characterised " elementary species " from a native breed, but a more minute analysis of the native breed reveals that they are connected with each other by the finest transitions, and the differences are only in the rarest cases of a qualitative " botanical " nature, and this especially for those qualities with which practical breeding deals. Further, in quite similar morphological types the physiological characters most important in breeding, such as productivity, resistance to disease, lodging and cold, early maturity and the like, may be essentially different. In consequence of this, "separation by lines" instead of " separation by forms " was introduced in the years 1901-03. Instead of separating out from old strains a relatively limited number of morphologically characterised forms and fixing them by continued selection, while further improving them by utilizing the new variations which appeared, as had been done until then at Svalöf also, further improvement in this direction was abandoned because no good results had been obtained (1); in its place a more extensive improvement of old varieties was resorted to, by selecting for separate cultivation from each variety to be bred, the greatest possible number, sometimes several hundreds of plants, without caring whether their outer appearance was the same or not, and their descendants were compared as to their production and practical value. From these descendants or lines the best were finally picked out. A further selection for the better fixation of the characters of the finally selected lines was not usually made, because with this separation of lines from old breeds of mostly self-pollinating cereals the lines in general were already sufficiently fixed. This is explained by the fact that by continued selfing only the homozygotic combinations can be maintained in the long run, as Mendel had already shown.

The descendance resulting from crossing was treated in a similar manner, only the separation of lines was frequently repeated. By this method of separation by lines all the new improved varieties have been bred.

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(1) Further improvement was sought for by means of suitable crossing.

In the attempts made to obtain desired combinations from crosses, it must be noted in the first place that most of the practically important characters are very probably excedingly complex "construction characters" (Konstruktionseigenschaften). After crossing two constant forms or lines which represent two degrees of a character, *e. g.* size, resistance to rust or cold, time of maturing, the segregation is always complicated and can only be ascertained by the separate cultivation of all the F2 plants and by the comparison of the average characters of their offspring in F3.

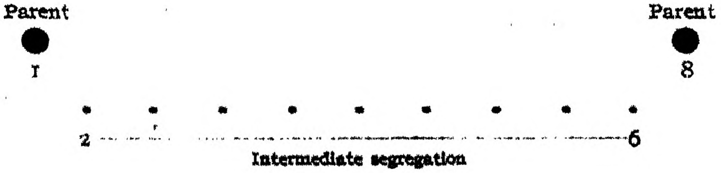
With regard, for instance, to the medium height of plants, the constant oat plants vary very much; there are taller and shorter lines in a whole series of degrees which could be represented by:

1 2 3 4 5 6 7 8 9 10.

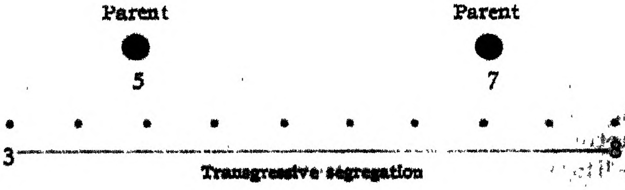
Crosses between any two tall and low constant lines do not give (or only in the rarest cases) the simple Mendelian segregation. The segregation does *not* take place in the following manner:

Cross 1×8. F_2: ¼ homozygote 1, ½ intermediate heterozygote, ¼ homozygote 8.
" 1×5. F_2: ¼ homozygote 1, ½ intermediate heterozygote, ¼ homozygote 5.
" 5×8. F_2: ¼ homozygote 5, ½ intermediate heterozygote, ¼ homozygote 8.

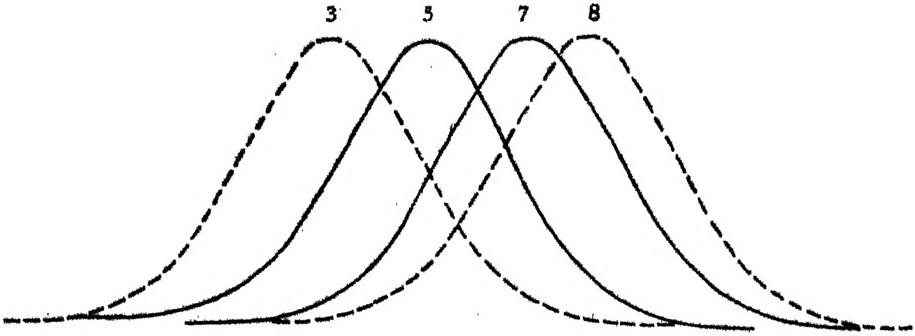
On the contrary, the segregation after crossing for instance 1×8 gives a whole series of gradations, among which those of the parents are very rare or may be completely wanting, so that the whole segregation is intermediate and does not attain the limits given by the parents:



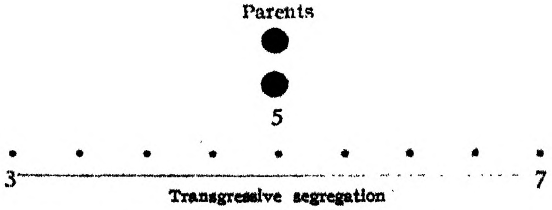
Inversely, when two medium slightly different lines, such as 5 and 7, are crossed with each other, the segregation is very often, and sometimes considerably, *transgressive*, that is degrees appear which exceed the limits of the parents in one or in both directions; lines are formed which on the average are taller or shorter than their parents and which on further cultivation show that they possess this character as a true hereditary trait:



As every hereditary line shows certain fluctuations in its modifications, which can sometimes be very considerable, the transgressive segregation might perhaps be better represented as follows :



The fact is also important that lines that possess the *same* degree of a character give on crossing segregations which form transgressive lines :

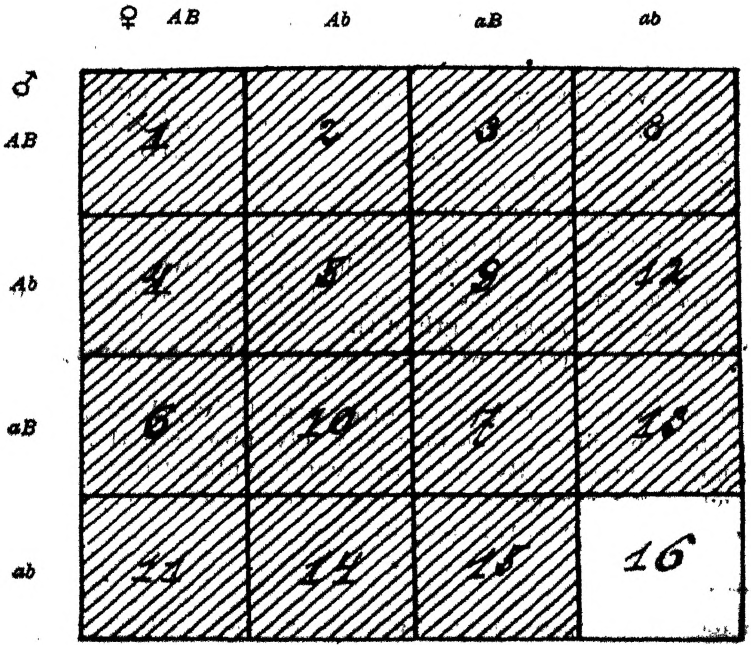


This is the manner in which all the quantitative practically important characters that the writer has investigated in wheat and oats behave ; such, for instance, are the degree of resistance to cold (cf. *Zeitschrift für Pflanzenzüchtung*, Vol. 1, 1912, pp. 3-12), early maturity (cf. *Compte rendu de la IV conférence intern. de génétique à Paris*, 1911, pp. 136-155 : Paris, 1913), resistance to rust and to lodging, productivity, size of grain. The extensive researches of Tedin on barley (short notice in *Popular Naturvet. Revy*, 1912, p. 216) show many quite similar results, in regard to early ripening, degree of emergence of the ear from the sheath, and so forth. Sometimes the transgressions after the crossing of constant lines of medium characters are very considerable (*e. g.* the time of ripening of oats).

On the basis of all the facts, agreeing for several characters, and concerning the behaviour of segregation not only in F2 but also in the following generation (in F3), it is to be noted among other points that the segregation in certain descendants is considerably greater than in others. The writer has suggested the theory that all practically important characters are of a complex nature (" Konstruktionseigenschaften ") determined by inner Mendelian factors, which through various combinations, form the long series of hereditary constant gradations.

The writer starts from the behaviour, which in rinciple is quite the same, of other characters, which submitted to the analysis of crossing have revealed themselves undoubtedly polygenous, that is determined by several Mendelian factors.

The most important are the factors which operate in the same direction (gleichsinnige Faktoren); a character, *e. g.* the red colour in wheat, may be built up by several factors, each of which has the same exterior effect, that is, each of them possesses the power of determining the appearance of the character. (For this phenomenon Lang proposed the name "polymery" and Plate that of "homomery"). The black colour of the glumes of oats may be determined by two factors, instead of by only one as is generally the case. Then in F_2 the segregation 3 black: 1 white according to the simple Mendelian scheme does not take place, but instead the segregation 15 black: 1 white. There are two black factors, *A* and *B*, each of which is capable of producing the black colour. After crossing with a white variety (*AB ab*), a black F_1 plant is formed, which produces the four kinds of gametes *AB*, *ab*, *aB* and *ab*; from the 16 combinations of these gametes only one (*ab ab*) will be white, because all the combinations into which either one or both of the factors *A* and *B* enter will be black. The ratio of 15 black: 1 white in F_2 is thus produced, as may be seen from the following figure:



Of the 15 black F2 plants 7 (1-7) remain constantly black in F3; 4 (8-11) segregate again in the ratio 15 black : 1 white, and 4 (12-15) in the ratio 3 black : 1 white.

Segregation follows the same law when three factors operating in the same direction are present, as in the red colour of the grain in wheat. Crossing of a three-factor red line, *ABC*, with a white one, *abc*, produces in the F1 plant eight kinds of gametes *ABC*, *ABc*, *AbC*, *aBC*, *Abc*, *aBc*, *abC*, and *abc*. Of the 67 possible combinations 63 are red and only one (*abc* × *abc*) is white. In F2 the ratio is 63 red : 1 white and in F3 it obeys the law as expected.

When four factors in the same direction are present, the ratio in F2 is 255 : 1; the writer considers it highly probable that this is the case with the ligule character in oats.

In the crosses of two lines, each of which possesses an independent factor operating in the same direction (*Ab* × *a B*), the offspring will include some combinations in which both factors enter and others in which they are absent. Through crossing two red-grained wheat lines which had exactly the same appearance, the writer oblained in F2 the segregation 15 red : 1 white and in F3 the further segregation as expected. (*Berichte der deutschen botanischen Gesellchaft*, 19, 1911, pp. 65-69):

	red *Ab*	×	red *aB*	
red *AB*	red *Ab*		red *aB*	white *ab*

In the same way the crossing of two very similar common oats, each of them possessing a factor for spreading branches (*Ab* × *aB*) produced in F2 and F3 the one-sided oats (*ab*) as well as forms (*AB*) with branches more divergent than in either parent, as expected.

In this manner apparent novelties, apparent mutations, arise.

The writer has found factors having the same direction in determined numbers, in a series of quite different characters of wheat and oats, not only in the *colour* (of the glumes in oats, of the ear and grain in wheat), but also in the *size* and *form* (length of the internodes in the ears of wheat, type of panicle in oats) (1), as well as in several other characters (presence of ligule in oats).

Factors in the same direction are often cumulative, that is, their effects add up, so that the character is more strongly impressed the greater the number of factors present. By means of several combinations of the factors, especially when heterozygotes are taken into consideration, a continuous variation of a hereditary nature may arise.

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(1) The common oats possess several factors in the same direction for distant insertion of the branches; on crossing with Tartarian oats (*Avena orientalis*), the one-sided oats in F_2 do not amount to a quarter of the individuals, but to a much lower proportion.

The above-described behaviour of the practically important characters (resistance to cold, rust, etc.), giving intermediate and transgressive segregation, is easy to understand by means of the theory of several factors working in the same direction and of a cumulative nature. Already with four factors, on crossing the extremes (*ABCD* × *abcd*) these extremes will be formed only once each in every 256 individuals; all the other 254 individuals are intermediates; in a limited number of individuals *the whole segregation is intermediate.* The individuals of medium character will be the most numerous, because the gametes with medium number of factors (two factors) are the most numerous. By means of the curve of combinations (Kombinationskurve) of several factors operating in the same direction the origin of a normal curve of frequency of hereditary variation is at least partially explained (1).

The transgressive segregation of practical characters after crossing two intermediate constant lines is to be attributed to the presence of several factors operating in the same direction in these lines, in the same way as the crossing of two similar red lines (*Ab* × *aB*) gives rise to partly deeper red (*AB*) and partly white (*ab*) as transgressions.

The principle of the action of several factors in the same direction represents, for practical breeding, the principle of the work of continuous combination.

In winter wheat, the object aimed at is to combine always in a better manner the probably many inner factors which determine the practical characters of productivity, resistance to cold, to diseases and to lodging, etc.; and little by little good progress has been achieved in the desired direction (see above), even if the chief aim of the work, namely to unite the productivity and other characters of the best West European varieties with the resistance to cold of the native Swedish varieties, is still far from being attained.

Further, an endeavour is made with both wheat and oats to obtain an increase in productivity by crossing two varieties, equally productive, which might eventually be the combination of several factors. In this direction some results have already been obtained, with winter wheat (Cf. *Sveriges Utsädes forenings Tidskrift*, 1912, pp. 317-318) and with oats (result not yet published).

The principle of continued combination work in practical breeding is not based only on the principle of factors operating in the same direction, but in general on the multiplicity of the inner factors which determine the exterior characters, and the complexity of the segregations caused by it. Even when only *one* factor working in a particular direction (*e g.* for black glumes in oats) is present and in F2 the segregation is 3 black : 1 white, the segregation is by no means simple, because the black homozygotes may show very various shades of black, which points to the existence of modifying factors (reinforcing or inhibitory factors). A similarly modified segregation is very frequent in several characters of wheat, as well as of oats; the writer is conductnig special experiments for the investigation of this question. He has recognised quite special inhibitory factors in both wheat and oats (*Zeitschrift fur induktive Abstammungs- und Vererbungslehre*, 5, 1911, pp. 1-37), and it is very probable that these inhibitory factors also are not simple, but series of factors, and that there may be inhibitory factors operating in the same direction.

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(1) By the term "Combination" German writers (Baur, Schinz) mean a *variation* produced on the one hand by segregation of hybrids and on the other by new combination of "hereditary units". Cf. BAUR, ERWIN: *Einführung in die moderne Vererbungslehre*, pp. 186-187. Berlin, 1911.

Considering this multiplicity of inner factors and the consequent possibility of improvement — though it may be slow and gradual — by the combination of these factors, the writer has come to the conclusion that together with the selection of already existing combinations, systematic artificial continuous crossing will in the near future play the most important part in plant breeding.

The writer has several times recognized spontaneous variations in homozygotic lines (*Zeitschrift fur induktive Abstammungs- und Vererbungslehre*, 5, 1911, pp. 1-37; *Verhandlungen des Naturforscher Vereines in Brünn*, 50, 1911, pp. 139-156). These spontaneous variations are always due to the disappearance of Mendelian factors (mutations by loss), and nothing new has been produced in the cases hitherto observed. Nevertheless, the writer considers it not impossible that there may be mutations by loss which will prove valuable to breeders. For the investigation of this question also the writer has extensive experiments in course.

DETAILED PUBLICATIONS ON THE BREEDING WORK OF THE WRITER.

NILSSON-EHLE. 1. Ueber die Winterweizenarbeiten in Svalöf in den Jahren 1900-1912, (Work on winter wheat carried out at Svalöf from 1900 to 1912). — *Beiträge zur Pflanzenzucht*, III, pp. 60-86. Gives a complete list of the writer's 51 publications on wheat.

2. (Experiments in crossing oats and wheat). — I. *Lunds Universitets Årsskrift* 1909, N. F. Afd. 2, Vol. 7, No. 2, pp. 122. — *Ibid.*, 1911, N. F. Afd. 2, Vol. 7, No. 6, pp. 84.

3. (Annual Reports on the work on oats and wheat at Svalöf). — *Sveriges Utsädesförenings Tidskrift*, 1906-1912.

The Present State of Motor Cultivation in Germany

by

DR. GUSTAV FISCHER,

Professor at the Royal Agricultural Higher School in Berlin.

Farmers who possess large extents of heavy soil can use to advantage the double-engine system of steam ploughing in which a balance plough is hauled by a wire rope alternately by each engine. The increase in the

Fig. 1
Stock's plough.

Fig. 2
Stock's plough and harrow.

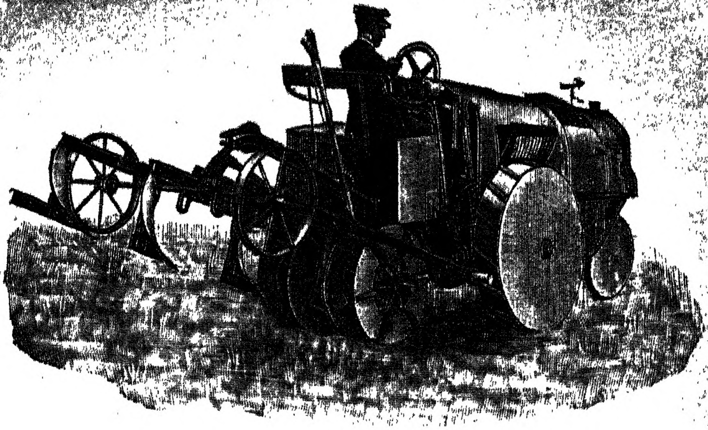

Fig. 3
Gustav Pöhl's motor plough.

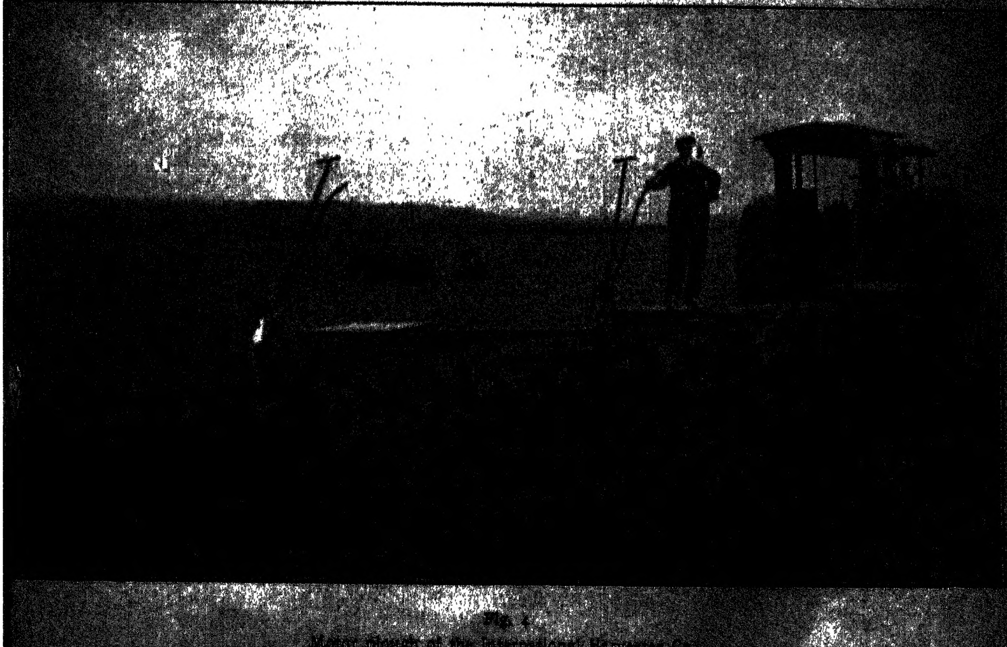

Fig. 4
Motor plough of the International Harvester Co.

number of farms in Germany which use steam ploughs, namely from 836 in 1882 to 2995 in 1907, shows that the need of mechanical aid in the tillage of the soil has steadily increased and that at the same time the machine industry has satisfactorily met the demands made upon it. But the figures given for 1907 are exceedingly small in comparison with the total number of farms. In fact they represent only a little over 10 per cent. of the farms covering upwards of 250 acres. All the other farms had to plough their land in that year and the three following years with teams, because the electric outfits that were used in some few farms might have been counted on the fingers of one hand.

At the same time the want of a cheap, mobile, mechanical plough, suited to small farms and to the shallow tillage of light soils, was all the more keenly felt as the conditions of labour grew worse and the advantages of careful tillage were more universally recognized. The hope that the use of oil engines would soon solve the difficulty, which the cumbersome steam engine could not, seemed at first impossible to be realized, and several eminent engineers considered the problem of motoculture as an insoluble one. But the laborious and expensive experiments of Robert Stock, a man who had much practice in mechanical technique and who had learned, on an estate he had then bought, to appreciate the difficulties of tilling the soil, resulted in a practical solution of the problem. In the spring of 1910 he was in a position to put before the public the first motor plough.

With a few unimportant modifications, several hundreds of Stock's motor ploughs are now used and, under suitable conditions, work satisfactorily. These ploughs weigh between 4 and 4 ½ tons. They are so constructed that almost the whole of their weight is carried by the driving wheels, thus producing the necessary friction between the wheels and the ground. The wheels are 7 ft. 4 in. in diameter and only 6 ⅓ inches wide; they are furnished with lugs which project on both sides about 4 inches beyond the tyres of the wheels, so as to allow sticky soil to fall of easily. These lugs are not arranged transversely, but somewhat inclined, so that they penetrate into the soil obliquely, thus ensuring against skidding and facilitating their coming out of the ground. In order to utilize to the greatest extent the weight of the machine on the driving wheels, the four-cylinder benzine motor is situated well in front so as to counterbalance the plough shares with their frame placed at the back. The steering wheel at the tail of the machine bears thus a very small part of the weight.

Stock's plough met with great success for its several good points. It is simple in construction, for the motor and the implement form a single and indivisible whole. Nor is its working less simple. The driver sits in a light seat, with the steering wheel, the crank for regulating the depth of the shares, and the levers for driving the motor close to his hands; by means of one foot lever the motor is thrown into gear and by another one the regulator of the depth is disconnected. The machine is further simplified by there being no device for reversing or for changing its gear when once started at a certain pace. This simplicity, however, is attained at the expense of some advantages. The change in speed can only be obtained by changing the gearing, which can only be done when the machine is not working, and besides requires a certain amount of time.

A test of Stock's plough made by the writer in 1911, on behalf of the Colonial Committee, gave the following results as to work done and consumption of fuel (1). On a mild loamy sand the motor plough worked nearly 1.73 acres in one hour to a depth of 6 ½ inches. The field was 700 yards long and of a convenient shape. Another day 1.48 acres per hour were ploughed to a depth of 8 3/4 inches. Lastly, in consequence of several stoppages due to the field not being sufficiently dry, only 0.99 acre was ploughed per hour to a depth of 7 ¼ inches. The consumption of benzine was under the favourable conditions of the first day only 12.3 lbs. per acre, but on an average in practice it ranges from 14.3 to 19.6 lbs. per acre. The power developed, as registered by a brake dynamometer, was 33.9 H. P.

The technical success of this machine was a stimulus to other inventors to similar attempts and to further improvements. Most of them considered the want of the means of changing the speed, and especially of reversing, as disadvantages, and it must be recognized that this is true. On quite level and uniform ground a change of speed is not necessary, but when slight undulations or depressions are to be traversed it is a drawback to have to keep up the same slow pace that has to be taken for going up hill according to the power of the motor. Still more important is reversing, for as soon as the plough is brought up by a big stone, or through a slight error of the driver by any other obstacle, the machine generally requires the assistence of horses to shift it; while if it could back it could easily disengage itself. Recently, the firm Stock has been providing its ploughs with reversing gear if demanded.

Since 1910 a number of motor ploughs have been invented, but only a few of them have survived, and deserve to be mentioned. Very similar to the Stock plough is the Wandeler-Dohrn plough of the German Motor Plough Co. (Deutsche Kraftpflug Gesellschaft); but it has reversing gear and two speeds, and its management has been cleverly simplified. The shares are fastened to a special frame which can be easily lifted and lowered, being fitted into a main frame.

The machine of the Gast Motor-plough-building Co., Ltd. (Gast Motorpflugbau G. m. b. H.) in Berlin (2) is very light. Both the tractor and the ploughing outfit are mounted on spring frames. The tractor weighs only about 2 ¼ tons. The Gast plough has reversing gear and various speeds ranging from 2.8 to 5.3 miles per hour. The separation between the motor and the ploughs which has been made in this machine has been followed by most builders. It facilitates the use of harrows, mowers, root lifters and similar machines, and is absolutely required by many farmers. At the

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(1) *Verhandlungen der Kolonialtechnischen Kommission des Kolonial-Wirtschaftlichen Komitees*, 1911, No. 1, p. 41 *et seq.*, No. 2, p. 62 *et seq.*

(2) Since the above was written the Gast Co. has been wound up. (*Author's note*).

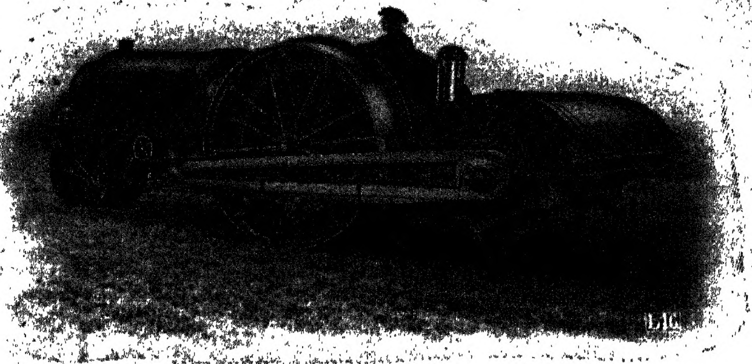

Fig. 5
Heinrich Lanz's revolving-hoe ploughing machine.

Fig. 6
Meyenburg's motor tilling machine.

same time it must be recognized that the unity of construction of the Stock plough is one of its principal merits, because, setting aside all secondary considerations, it is built exclusively for ploughing. Besides, those who possess Stock ploughs have already devised methods for attaching other implements instead of the plough shares.

Of quite special build is Pöhl's patent motor plough, devised by Gustav Pöhl, of Gossnitz (Saxe-Anhalt); this carries in front of every plough share a revolving coulter, consisting of a sharp disk with projecting blades which have the object of easing the work of the plough by breaking up the soil and thus diminishing its resistance.

This feature makes Pöhl's plough resemble semewhat those machines (Landbaumotoren) which till the soil not by means of plough shares but by revolving hoes. Among these the one that has been most tested is the one invented by the Hungarian Köszegi, the building of which has been undertaken by the firm Heinrich Lanz, of Mannheim. Lanz's machine has now assumed a form so different from Köszegi's original, that only the manner of working has remained the same. The driver sits on a three-wheeled vehicle resembling a motor car and controls the whole machine. The shaft, with the disks that bear the cross-blades, is situated at the hinder end and is driven by an endless chain; it can be raised or lowered by the driver by means of a hydraulic apparatus.

Somewhat similar is the v. Meyenburg's "Landbau motor" of the Motorkultur Joint Stock Company, Bâle, built by the Siemens-Schuckert works. It differs from the Köszegi machine chiefly in the elasticity of the hoes, which are not of rigid sheet iron, but consist of curved claw-like steel wires. The advantage of the elastic hoes is claimed by the inventor to lie in their being able to avoid stones and other dangerous obstacles, and consequently to last longer than rigid hoes and to require less power.

The experience gathered as to these revolving disk machines is as yet insufficient to pronounce final judgment upon them. As indeed none can yet be pronounced upon motor ploughs, in spite of the fact that these are used in much greater members. Present experience shows that the revolving disk machines require more power than motor ploughs. On the other hand the work they perform is more intense, since they work the soil like milling machines and reduce it to a fine tilth. They accomplish at once without requiring any further assistance, what frost and changes of weather do after ordinary ploughing. Such a finished tilling is well worth a few pounds of benzine, and it would be unjust to make capital of this greater consumption against these machines. Possibly Meyenburg's machine, owing to its elastic hoes, may be made so much lighter than motor ploughs that the saving in weight will bring about a notable saving in power, as the work consumed in running the machine varies with its weight. But just this machine is one of those that has been tested least. It is proposed to build it in various sizes down to 8 H. P., and in breadths ranging, according to the depth of the work, from 32 to 56 inches.

The reason for the more favourable conditions, at least in theory, of work of the revolving tilling machines as compared with those of the motor ploughs, lies chiefly in the fact that their working disks revolve in the same direction as the driving wheels and that while working they propel also, or at least even in the most unfavourable conditions they do not act as brakes as plough shares do. The fear that the finely divided soil would soon be compressed again has in no case been justified. Manures and stubble get distributed throughout the tilled layer, and only in soils overrun with couch grass are unfavourable results to be apprehended from the possibility of increasing the infestation by the couch grass being cut up into so many small pieces. From the point of view of tillage there are hardly any objections to be raised against these machines, but their technical execution is not yet quite satisfactory. For this reason Meyenburg's machine is not yet on the market, and Lanz has had some lack of success with his machine in 1912. On a heavy soil it did not work beyond a certain depth, because the motor, in spite of its 60 H. P., was not strong enough and the surface of the ground was left uneven in the wake of the machine owing to unequal depth of work, due to the disk shaft not being properly supported. Both inventors are actively occupied with the improvement of their machines. Lanz's machine in a modified form has already worked very well this spring.

For soft soils such as moors, most motor ploughs are too heavy. This is especially true for American machines, which work satisfactorily on many other German soils. They are all built on the tractor system to allow hauling other implements besides ploughs. The ploughs are so arranged in the American machines that a man can stand on a kind of platform and regulate the depth of the shares while the machine is running. In some machines each ploughshare is independent and yields if an obstacle is encountered; in others they are united in groups, as in the Moline Plow Company's plough, in which they are in two groups of four. For greater depth of work (8 inches and upwards) American builders prefer disk ploughs; it is true that these do not leave the bottom of the furrow smooth, but they penetrate easily into the soil even under difficult conditions, as for instance when long stable manure has to be ploughed in.

American tractors have no very projecting grips on the tires of their wheels, which are very broad, but only low obliquely set lugs. The most frequently used tractor of the International Harvester Coy. (Ihace Tractor), in its largest size, has hind wheels 6 ft. 4 in. in diameter and 24 in. wide, which can be further widened by additional tires 14 inches wide. Its motor is about 45 H. P., and its weight 9 ¼ tons. The form of the wheels is well adapted to hard soils, and allows of the machine passing from the fields to hard soils without being obliged to unscrew the grips or to put fenders between them to prevent their being damaged, as is the case with Stock's plough. But on soft soils the wheels have not enough grip, and they begin to skid in places where Stock's plough continues to go ahead. The great weight of the machine is also a difficulty in soft soils. As traction engine the machine can naturally be used without any alteration.

In order to work with motor ploughs on moors, recourse must be had to haulage with steel ropes, but instead of steam engines, oil motors are used, as smaller power is sufficient. Hartmann, of Berlin, builds his plough on the one-engine system, and fixes the drum on which the tail rope is paid out on an iron carrier mounted on rollers which is anchored in the ground. In Neukirch's system (Löckritz engine works) there are two portable engines of 22 H. P., each of which drives one drum which alternately hauls the cable pulling the plough and the cable anchored at the other end which serves to move the engine forwards. The experiments carried out with the Neukirch plough on the Pomeranian moors have yielded good results.

The results hitherto obtained with motor ploughs in Germany do not allow of a final judgment being passed on them, but they have confirmed that for light and medium soils some very useful machines exist. Gradients above 1 in 10 offer considerable difficulties, because the machines require for their own propulsion so much power that not enough is left for actual work. Stones also, when they are numerous and big, are a serious hindrance. Many American ploughs have safety appliances in the shape of wooden pegs which break when the plough runs against a large stone, and the share and the beam pivot round. But when there are many stones the pegs break so often that the amount of work done is diminished. On hard soils the American tractors work best, while on soft soils ploughs of the Stock type are preferable. Depths of work reaching to 8 or 10 inches can be obtained on most soils ; greater depths are not so sure. Disk ploughs seem to penetrate more easily to considerable depths than the others ; but even Stock's ploughs have reached, according to the statements of practical men, as much as 12 to 14 inches and even 15 ½ inches. I give these figures, however, with reserve.

The amount of work done by a motor plough may be set down at an average of 1¼ to 1½ acre per hour ; on heavy soil and with deep work it sinks to about 1 acre. The consumption of benzine, borneoxol or benzol costs, under average conditions, 3*s* 11*d* to 5*s* 7*d*.—Benzol costs 15*s* per cwt. and does not work so cleanly as benzine which after combustion leaves no residue, but is dearer. Unfortunately the prices of liquid fuel have constantly risen and are much less steady than those of coal, which is besides cheaper for the same amount of power developed. These data bring an element of uncertainty into the calculation of the profitableness of these systems of ploughing, and still more is this the case with the figures representing wear and tear and repairs. The data supplied by practical men vary within very wide limits ; motor ploughs are still too recent to allow of their durability being determined. Several owners have already had to pay considerable renovation expenses. It is usual to calculate for interest, amortizement and repairs 25 per cent. of the purchase price, which amounts for Stock's and similar ploughs to about £830, for the large Ihace ploughs £1130 and for the smaller ones £735. Such figures will have to be reckoned with, even with good and well schooled drivers, because the machines have to work under unfavourable conditions and the quick-running motors (Stock with 720 revolutions) soon wear out. Ihace has a motor that makes only 240 to 335 revolutions, but it appears doubtful whether its construction equals that of German motors.

Within the next few years the question of profitableness will be cleared up. In the meantime it is certain that for the shallow and moderately deep ploughing of the light and medium soils so prevalent in Germany motor ploughs assist very materially by the careful and seasonable tilling which can be done with them, and in overcoming the difficulties which the unfavourable labour conditions oppose to the increase of the total yield of crops.

Report on the Diseases observed at the Phytopathological Laboratory of the National Museum of Rio Janeiro

by

ANDRÉ MAUBLANC,

Chief of the Laboratory

With the exception of some investigations concerning the most important economic plants, chiefly coffee, it may be said that phytopathology has been hitherto much neglected in Brazil. Certainly some naturalists have collected abundant material which allowed an idea, though a somewhat incomplete one, to be formed of the especially rich mycological flora of the country; but this material has for the most part been studied in Europe, and the specialists who dealt with it could not direct their researches beyond the morphology and the system of the fungi on cultivated and spontaneous plants.

Since its foundation, still quite recent (1910), the Phytopathological Laboratory of the National Museum of Rio Janeiro has been obliged, through lack of proper installation, to limit its efforts to the scientific determination of the diseases which it examined; but the definitive organization of this Laboratory, which is now an accomplished fact, will allow of more exhaustive phytopathological researches being made and of dealing with biological questions, which are the most important for the practical conclusions which may be drawn from them as to treatment.

Still, even now it appears to me to be interesting to state briefly which are the most important and most widely spread parasitic fungi on cultivated plants in Brazil, almost exclusively in the Southern States: from Rio de Janeiro to Rio Grande do Sul, the only region from which the Laboratory has sufficient material. This information may be of real importance, as it is only by the comparison of similar statistics published in the various countries that an exact knowledge will be acquired as to the distribution of the principal diseases, and this seems indispensable, if it is intended by an international understanding to arrive at legislation capable of reducing to a minimum the danger of introducing into a given region diseases which are still unknown to it.

COFFEE. — The coffee plant, which is of capital economic importance to Brazil, is, especially in the State of São Paulo, almost immune from plant parasites of any importance. Certainly the leaves present some spots caused by various fungi : *Cercospora coffeicola* Berk. and Cooke (the most frequent species), *Sphaerella Coffeae* Noack, *Colletotrichum coffeanum* Noack, *Stilbum flavidum* Cooke, and *Phyllosticta coffeicola* Spag. ; these two latter are confined to some moist localities of the coast belt and are unknown in the great plantations of the interior. None of these fungi are really dangerous and their effects can not be compared to those caused by unfavourable climatic conditions and especially by the cold winds from the south, which sometimes lead to the drying up of the branches.

Some cases of rot are also to be mentioned ; they are due to a fungus which has not yet been determined, and have been found in the State of Minas Geraes ; but they are purely local cases.

SUGAR CANE. — This crop, also very important, does not suffer from dangerous diseases in Brazil, at least in the greatest number of plantations ; only rare cases can be mentioned of the appearance of disease due to *Colletotrichum falcatum* Went. (morve rouge) and to *Thielaviopsis paradoxa* (de Seynes) v. Höhn (pineapple disease). *Leptosphaeria Sacchari* v. Breda de Haan and *Phyllosticta Sacchari* Speg. cause only insignificant injury to the leaves.

TOBACCO. — Tobacco leaves often bear spots due to *Cercospora Nicotianae* Ell. and Ev., and also other spots the causes of which are not yet well known : they do not seem to be due to parasites and are often designated by the vague name of " rusts ".

MAIZE.— Only maize rust (*Puccinia Maydis* Ber.) has to be mentioned, and it is of no great importance.

MATÉ. — A great number of fungi, especially on the leaves, but seemingly not dangerous, have been noticed by Spegazzini on Maté (*Ilex paraguariensis*), a plant of the greatest economic importance in the south-western States of Brazil. I have recently had occasion to study the leaves of this shrub, on which I have recognized the presence of the following species : *Phyllosticta Mate* Speg., *Cercospora Mate* Speg., *Colletotrichum Yerbae* Speg. and *Pestalozzia paraguariensis* Maubl. (description not yet published).

RICE. — Only *Piricularia Oryzae* Cav. is to be named.

COTTON. — The leaves of cotton are frequently attacked by *Uredo Gossypii* Lagerh. and *Cercospora gossypina* Cooke. A more serious disease is " fruit rot " ; it is imperfectly known and doubtless due to the action of bacteria introduced by the punctures of insects.

VINE. — In the south of Brazil, vines have suffered from the following diseases: *Cercospora viticola* (Ces.) Sacc., the most frequent species, and when widely spread producing a serious disease ; anthracnose (*Gloeosporium ampelophagum* [Pass.] Sacc.), very frequent ; powdery mildew (*Oidium Tuckeri* Berk.); mildew (*Plasmopara viticola* [Berk. et Curt.] Berl. et de Toni) ; *Coniothyrium Diplodiella* (Speg.) Sacc., form on leaves hitherto very rarely observed ; *Septoria ampelina* B. et C. ; *Colletotrichum ampelinum* Cav. ; *Pestalozzia uvicola* Speg.

WHEAT. — On wheat, in the south of Brazil, smut (*Ustilago Tritici* Jens.) has been reported, and especially the rust, which, according to the samples received, is due to *Puccinia glumarum* (Schm.) Eriks. et Henn.; in one case only was I able to ascertain the presence of *Puccinia graminis* Pers. occurring with the preceding species.

FRUIT TREES. — The following list includes the parasites observed up to the present :

Guava tree : *Puccinia Psidii* Wint. (on leaves and fruits) ; *Gloeosporium Psidii* Delacr. ; *Pestalozzia Psidii* Pat.

Mangoes : *Gloeosporium Mangae* Noack. (on the fruit); *Gloeosporium Mangiferae* Henn. (on the leaves).

Bananas : *Gloeosporium Musarum* Cooke and Mass.

Citrus fruits, various : gummosis ; *Colletotrichum gloeosporioides* Penz. ; *Septobasidium albidum* Pat. (on the excreta of scales).

Jaboticabeira (*Myrciaria Jaboticaba*) : *Uredo Rochaei* Puttem, and *Oidium Rochaei* Putt.

Fig : *Uredo Fici* Cast. and *Phyllosticta sycophila* Thüm.

Papaw : *Sphaerella Caricae* Maubl. (very frequent in its conidial form *Asperisporium Caricae* [Speg.] Maubl.).

Cambuca (*Eugenia edulis*) : *Uredo Cambucae* Henn.

Peach : *Monilia fructigena* Pers. and *Cladosporium carpophilum* Thüm.

Apple : *Gloeosporium fructigenum* Berk. and *Macrophoma malorum* (Berk.) Berl. et Vogl. (on fruit).

Pear : *Gloeosporium fructigenum* Berk.

Quince : *Gloesporium fructigenum* Berk.

Plum : *Puccinia Pruni-spinosae* Pers.

Japanese plum (*Prunus trifolia*) : *Gloeosporium fructigenum* Berk. and *Monilia fructigena* Berk.

VEGETABLES.

Cauliflower : *Alternaria Brassicae* (Berk.) Sacc. This species, studied by M. Puttemans, has caused serious damage, attacking the leaves and the flowers in the State of Rio de Janeiro.

French Beans : *Colletotrichum Lindemuthianum* (Sacc. et Magn.) Br. et Cav. ; *Uromyces appendiculatus* (Pers.) Link ; *Oidium erysiphoides* Fr. ; *Isariopsis griseola* Sacc.

Peas : *Oidium erysiphoides* Fr.

Tomatos : *Septoria Lycopersici* Speg. (very frequent species).

Carrots : *Macrosporium Carotae* Ell. et Langl.

Asparagus : *Cercospora Asparagi* Sacc.

Celery : *Cercospora Apii* Fres.

ORNAMENTAL PLANTS.

Roses : *Phragmidium tuberculatum* Muell. ; *Sphaerotheca pannosa* (Wallr.) Lév. (conidial form) ; *Marssonia Rosae* Br. et Cav. ; *Cercospora rosicola* Pass.

Carnations : *Heterosporium echinulatum* (Berk.) Cooke.

Dahlias : *Oidium* sp.

Begonia Rex : *Oidium Begoniae* Puttem.

Oak. — *Oidium alphitoides* Griff. et Maubl. The appearance in Brazil of this dangerous parasite is interesting ; it dates from the month of August 1912, when oak mildew was observed by M. Puttemans in the gardens and parks of São Paulo ; semewhat later I recognized its existence at Campinas and since then the disease has made much progress.

Lastly fumagine is very widely spread on the leaves of a great number of plants (Aurantiaceae, coffee plants, etc.), where it is the consequence of the attacks of scale insects and aphides.

The preceding list does not claim to give a complete picture of the fungus diseases existing in Brazil; it has been drawn up with the assistance of the documents possessed by the Phytopathological Laboratory of the National Museum, leaving out those species which do not present any practical interest, either because they attack wild plants, or because they do not cause any serious injury to cultivated plants. On the other hand a number of specimens preserved in the collections of the Laboratory have not been completely studied owing to want of time ; this study is being pursued at present and it may already be stated that a great number of parasites — the description of many of them has not yet been published — might be added to the above list.

Further, for instance at São Paulo, several fungi have been reported, some of them injurious to cultivated plants (*Phytophthora infestans*, *Plasmopara cubensis*, etc.), which do not appear in the above list. It would have been easy to lengthen it with the help of bibliographical data, but I wished to mention only those diseases which had been observed at the Phytopathological Laboratory of the Museum, and the specimens of which are preserved in its collections, thus allowing the determinations to be controlled.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

ISLATIVE
ND ADMINI-
TRATIVE
EASURES

644 – Project Relating to an Official Register of Selected Plants in Hungary. — *Köztelek*, Year 23, No. 32, pp. 1153-1155. Budapest, April 26, 1913.

M. Emile Grabner, director of the Royal Hungarian Institute for the selection of Plants at Magyaróvár laid stress, in the report which he presented to the committee of the above Institute, upon the urgent necessity for a regulation dealing with the systematic development of the selection of agricultural plants. Although in Hungary plant selection has been practised for a number of years, it is only during the last seven years that it has met with any success. As the first step to promoting systematic plant selection is the encouragement of the agriculturists engaged in the task, M. Grabner suggests for this purpose the establishment of an official register of the plants selected in Hungary; the chief heads of the project are as follows:

1) The objects of the register are on the one hand to protect the rights of Hungarian agriculturists engaged in selection and to prohibit the illegal sale of varieties which have been improved by them, and on the other to afford every guarantee to the purchaser of the strict selection of the variety which has produced the seeds he wishes to buy. This guarantee does not extend to the quality of the seeds (*e. g.* to their power of germination), nor to the value of the crop, but exclusively to the identity and purity of the variety.

2) The register will comprise field crops (cereals, root crops, oil crops, industrial crops and forage crops) systematically selected in Hungary. In the case of autogamous plants, only those can be inscribed which have been obtained from pedigree selection, or by the hybridization of pedigree varieties; in that of allogamous plants, only those are admissible which have been obtained in the same way, or by selecting families; but if this method is employed, it is necessary to prove that the parent plants were selected according to the revision and annual classification of the register. It is necessary, in the case of new varieties obtained from others already

on the register, to prove by authentic trials that they are improved in some essential point; otherwise such varieties cannot be admitted.

3). The official register of selected plants is kept at the Royal Hungarian Institute of Plant Selection at Magyaróvár. The folloving details must be entered: *a*) a minute description of all the green and ripe parts of the variety registered; *b*) its date of ripening; *c*) the relative yield of the variety and of its parent plant; *d*) the system by which the improved variety has been obtained. This document must be accompanied by 50 mature plants of the variety to be registered, or by 22 lbs. of roots.

4). When all these conditions have been observed, the Institute undertakes the further revision, and sends an official to the spot before the date of the harvest; it is his duty to examine the condition of the seed, the selection plots and the method of selection. This official draws up a report of his observations, which he submits to the Institute; the grower must furnish all the necessary data; but should he wish to keep his method secret for further experiment, the official is required to treat the matter as a professional secret. A registration fee of 100 crowns (4 guineas) is paid to the funds of the Institute for each variety and should the grower wish to register several selected varieties, the fee for each additional one is 25 crowns (1 guinea). If it is found, on inspecting the variety on the spot, that it cannot be registered, the amount of the registration fee cannot be refunded, but instead, the agriculturist has a right to another inspection within the year. The money obtained by the registration tax is deposited in the State banks. The Institute makes annual test sowings of the registered varieties on an area of 60 sq. yds. in the case of autogamous plants, and 240 sq. yds. for allogamous ones. The owners are required to provide the seed free. The essential characters obtained by these experiments must be compared every year with those exhibited by samples grown the preceding year and preserved in the Institute collection; if any difference is observed, or if the characters are not identical with those entered in the register, the owner in question must be informed, and it must be ascertained whether the variety he has put on the market is identical with that on the register: should the contrary be the case, the variety must be struck off the register. The continued selection of a variety entered on the register is controlled by the Institute, an official being sent once a year to the estate where the selection is being carried out to examine the plant and the method employed.

The Committee unanimously approved M. Grabner's project and will submit it for the approval of the Ministry of Agriculture.

625 — **Agriculture in Rumania.** — CARDAS, AGRICOLA in *La Vie agricole et rurale*, Year 2, No. 21, pp. 604-607. Paris, April 26, 1913.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

The total area of Rumania is 32 445 600 acres; of these 5 699 215 are occupied by forests, while 18 045 428 are devoted to agricultural purposes and are divided between the various crops as follows:

Cereals			12 801 157	acres
Wheat	5 111 695	acres		
Rye	264 904	»		
Barley	1 234 771	»		
Oats	943 051	»		
Maize	5 135 902	»		
Millet	109 364	»		
Buckwheat	1 470	»		
Textile and oil-producing plants			267 073	»
Leguminosae and potatoes			178 967	»
Industrial plants			60 841	»
Market gardens			58 220	»
Meadows (natural and laid down)			1 366 885	»
Vineyards			215 772	»
Plum orchards			183 292	»
Pastures			2 913 221	»

Arable land has so far steadily increased at the expense of the pastures. Nearly 85 per cent. of the whole arable land is under cereals (wheat 33.78 per cent. and maize 33.94 per cent.).

Large estates occupy 9 411 986 acres, which are divided between only 5385 properties, some of these consisting of more than 12 000 acres. There are 38 723 medium sized holdings of 25 to 250 acres ; these occupy an area of 2 131 200 acres. Small holdings account for 7 789 872 acres, divided between 920 939 owners.

The average wheat crop is 16.6 bushels (of 60 lbs.) per acre, while maize produces 14.5 bushels (of 56 lbs.) per acre.

The total value of the agricultural products of Rumania for 1911 is reckoned at £55 450 000, of which the cereals alone brought in £46 038 000.

The native vines have been almost entirely destroyed by phylloxera, but the vineyards have been replanted with foreign varieties, imported especially from Algeria.

According to the census of 1908, Rumania possesses domestic animals worth £22 186 500. The horses belong to eastern breeds : in 1908 there were 807 704, representing a value of £ 4 323 900.

The cattle chiefly present the characters of the steppe breeds. There is a mountain and a plain variety, each of which furnishes excellent draught animals, but they are poor for beef and milk. The 1908 census gave 2 585 205 head, estimated at £13 014 000.

Sheep are principally represented by the native Tzurcana breed, with long rather wavy wool, and the improved Tzigea breed, related to the Merino. According to the census of 1908 there were 5 104 506 head, worth £2 152 200.

Pigs also comprise a primitive native breed and an improved breed, the Mangalicza. Pig breeding is an important industry ; in 1908 there were 1 123 564 of these animals and their value was estimated at £2 371 670.

Farming methods are rather primitive in many districts; regular rotations are only followed on large estates, while the use of chemical fertilizers is very restricted. Cattle breeding also leaves much to be desired, though there is a pronounced activity in this direction.

Agricultural instruction is the subject of special attention on the part of the Government; it is imparted in 20 farm schools, 19 practical schools, some intermediate schools and one special school at Bucharest. The higher branches of agriculture are now taught at the Universities.

The Agricultural Credit Institutions are very prosperous. The Rural Land Credit possessed in 1909 credit letters to the amount of £15 293 300. There is, in addition, an Agricultural Bank, an Agricultural Credit, a Vine-growers' Credit, a Rural Bank and some Popular Banks.

626 – **Agriculture in Bulgaria.** — GANTCHEFF, G. in *La Vie agricole et rurale*, Year 2, No. 21, pp. 596-603. Paris, April 26, 1912.

The value of the agricultural products exported by Bulgaria in 1911 represented 88 per cent. of that of the total exports, whilst the imported agricultural products formed only 4.4 per cent. of the total. The country had a total area of 23 798 300 acres, of which 7 988 300 were arable land, 877 150 natural meadow, 22 725 fruit and mulberry plantations, 19 500 rose gardens, 234 650 vineyards and 2 255 700 acres pastures, while forests occupied 6 995 100 acres.

The area of the arable land is constantly increasing at the expense of the pastures and sometimes of the forests and meadows. Of this total area of 18 393 200 acres in 1908, 11 426 700 acres were private properties divided as follows:

Holdings of	less than 2 ½	acres . . .	about 100 000
» »	2 ½ to 12 ½	»	241 399
» »	12 ½ to 25	»	162 271
» »	25 to 50	»	94 331
» »	50 to 70	»	17 305
» »	70 to 250	»	9 175
» »	250 to 1 250	»	845
» »	over 1 250	»	91

Large properties are not only rare, but the area which they occupy is only 2 per cent. of arable land. Division into small holdings is carried to an extreme length and constitutes a serious hindrance to the proper cultivation of the land.

In 1908 there were 5 714 651 acres under cereals, 38 230 under industrial plants, 179 703 under pulse, etc., 67 505 under melons and water-melons, 22 710 under vegetables, and 234 727 under forage crops, while 1 577 000 acres were out of cultivation ("resting") and 153 900 acres were under worked bare fallow. Thus cereal cultivation occupied about 71.5 per cent. of the total cultivated area; this extraordinarily large proportion is explained by the fact that in Bulgaria maize is grown as a fallow crop and is considered a good preparation for wheat. Nevertheless, the farmers are gradually learning that this system would eventually lead to the complete exhaustion of the soil, and forage crops, especially vetches and lucerne, are steadily gaining ground. Amongst cereals, wheat occupies the first place: in 1911 there were 2 688 500 acres under wheat; then follow maize with

1 560 950 acres, barley with 620 440 acres, rye with 545 200 acres, and oats with 446 590 acres. Millet, spelt, rice and buckwheat are little cultivated and only in a few districts.

In 1911, tobacco occupied 29 945 acres and produced an average of 630 lbs. of dried leaves per acre. Only a small amount of the crop is exported, and that to Germany and Austria-Hungary; in 1910, the value of this export amounted to £81 000.

During the last five years, the area under rose gardens has been about 18 500 acres. In 1911 Bulgaria exported 9 772 lbs. of attar of roses, worth £237 954.

The same year, there were only 7330 acres under sugar beets, for there is at present only one sugar refinery; but two others are in course of erection, so that the cultivation of sugar beets will develop in the near future.

The use of improved agricultural machines and implements has increased much and with considerable rapidity during the last few years. The following shows the numbers in 1893 and 1905:

	1893	1905
Ploughs	18 710	69 577
Drills	35	297
Reapers	128	1 286
Thrashing machines	17	250

Cattle breeding is as yet little developed in Bulgaria, not only from the point of view of the number, but also of the quality of the animals. The efforts made by the State for the improvement of domestic animals have not met with much success; in the opinion of the writer this is chiefly due to the want of markets and outlets for trade. The country, in truth, possesses all the natural conditions for intensive stock breeding, as is proved by the brilliant success obtained with some breeds in the State farms. The most important and best-adapted breeds of cattle are the Montafon and the Oberinnthal; in two agricultural schools Simmenthal cattle are raised, while the Angle breed is kept at the Sadovo Agricultural School. Thanks to the high prices of butter and cheese, milk is more profitable than it was formerly. Cow and buffalo milk is either used in its natural condition, or as "kicélo-mléko" (yoghurt); very little butter is exported. Ewes' milk is chiefly used for making white cheese and "cacio-cavallo". In 1911, Bulgaria exported 2 393 100 lbs. of the former, worth £35 482 and 5 140 190 lbs. of "cacio-cavallo", worth £123 781.

For the purpose of improving horse breeding, the State has established three stud stations and two stallion depôts, with a total of 400 stallions, which travel throughout the country during the service period. Shows and premiums are also fairly frequent. For some years, the State has been buying good stud animals (bulls, cows, stallions and mares), which it lends to private individuals on condition that they keep the animals for three years under State control, and use them for breeding purposes. (In the case of cows, the State is entitled to one calf of a year old after three years). This system has so far not given good results, owing to lack of proper control.

On account of the ready sale of eggs, the stock of poultry has greatly increased of late years; while the eggs exported in 1891 were estimated at only £12 000, the figure for 1911 reached £541 000.

In 1887 there were 201 800 acres of vineyards in Bulgaria; but owing to the ravages of phylloxera the area was reduced to 147 480 acres of native vines and 20 170 acres of American varieties. In the last three or four years replanting with American vines has been carried out on a large scale.

The economic and natural conditions of Bulgaria are in general not favourable for fruit growing, though an exception must be made in the case of some little valleys where the climate is very suitable; one of these is Kustendil, where fruit trees supply one of the principal sources of revenue. There are some 21 230 acres of orchards in Bulgaria, but the value of the exported fruit is estimated at below £14 000.

Bee-keeping has lately made great progress. There were 220 934 hives in Bulgaria in 1908, which produced over 2 million pounds of honey; this was all consumed in the country.

At one time, the idea was entertained of planting mulberry trees in the place of the vineyards which had been destroyed by phylloxera and the State made every effort to encourage silkworm rearing. In 1891 the value of exported cocoons was only £16 890, while during the period 1906-1910 it rose to an average of £132 000 a year. But during the last two years (1911 and 1912) the great fall in the price of cocoons has destroyed the confidence of the silkworm breeders and the latter have already begun to cut down the mulberry trees.

627 - **Agriculture in French Guinea.** — SOLICHON. Les produits utiles de la Guinée française. — *Ministère des Colonies, Bulletin de l'Office Colonial,* Year 6, No. 63, pp. 65-76. Melun, March 1913.

Hitherto only traders have availed themselves of the vegetable wealth of French Guinea, and that to a limited extent, except in the case of rubber, which forms the principal staple of export. Until now the natives have only grown those crops which they required for their own consumption; they have tapped rubber trees and lianas, the produce of which is sufficient to cover the personal taxes levied on the inhabitants.

Soil. — Though but insufficiently tilled with hoes ("daba"), the soil is of extraordinary fertility. The country is mostly hilly, but it possesses also plains ("bowals") which provide pasture to numerous herds, and forests of tree-ferns and low trees, except in Lower Guinea where the lateritic, sandy loamy or clayey soil lends itself to rapidly growing crops.

Climate. — There is not much difference as regards rainfall and high temperature between Upper and Lower Guinea, with the exception of the mountain group of Fouta-Djalon where the temperature is mild and often cold. The climate of the highlands, that is of Middle and Upper Guinea, is easily supported by colonists.

Labour. — At present, owing to the emancipation of serfs, labour is more abundant; further, the railways have partly suppressed the use of porters, which system formerly absorbed most of the native labour. In general both porters and farm hands are paid from 7 *d* to 9 ½ *d* per day, besides about 1 ½ lb. of rice worth about 1 ½ *d* to 1 ³/₄ *d* per lb.

Agriculture. — The land may not be sold by those who occupy it because it belongs to the community of natives represented by the village or by a group of villages.

The intensive cultivation of rice, earthnuts, fonio, maize, cotton, to mention only the most important crops, would give excellent results in farms organized on modern lines and provided with steam ploughs and other agricultural machines and implements.

The chief native crops are:

Rice.— Cultivated throughout the whole of Guinea in the flooded plains and in the neighbourhood of swamps and watercourses. It is the staple food of the natives, who, it is estimated, consume about 709 000 tons per year, while the production of the country is valued at only 295 000 tons. The average price is about 10s per cwt., and the yield about £6 8*s* per acre.

Earthnuts. — Are grown only for home consumption, but they might be produced for exportation.

Fonio. — Is one of the crops most esteemed by the natives, who cultivate it intensively. This cereal gives, on being crushed, a very nutritious meal, which might be advantageously exported as a substitute for fecula and semolina.

Maize and *Manioc* are not exported.

Yams are not much grown.

Kola nut tree. — Grows well in Upper Guinea near swamps and flooded lands. It begins to bear fruit when about 10 years old and yields from 500 to 800 nuts. The current local price is about 1 ½ *d* per nut; in Europe the nuts are sold at 2 *s* 10 ½ *d* per lb. It might be one of the principal exports of Upper Guinea; nevertheless no Europeans have taken it up.

Bananas. — They are grown on a large scale by the « Camayenne » Colonisation Company and they are also exported. They thrive well only in Lower Guinea, though some specimens are found also in the high belt. Bananas begin to bear at the age of 18 months at latest. A banana plantation yields sometimes forty times as much as an intensively cultivated potato field. Along the Konakry-Niger railway and near the ports it is one of the most renumerative crops.

Coconuts thrive well along the sea coast, reaching inland about 30 miles into the forest region. They begin to bear at eight years of age and they yield an average of 33 lbs. of copra per tree per annum, worth 15*s* 9*d* to 18 *s* per cwt. (112 lbs). The principal trading firms are those of Hamburg, Liverpool and especially Marseilles, which buys yearly about £ 3 200 000 worth of copra from Manila, Ceylon, Singapore and Mozambique. The colonies of the Ivory Coast and of French Congo, richly endowed with dense forests, would lend themselves to the exploitation of this plant better than French Guinea, where however it would be easy to grow it along the coast, instead of which it seems quite abandoned in French West Africa.

Elaeis guineensis is abundant in French Guinea, but it is not so plentiful as in the Ivory Coast and Dahomey. Replanting this tree along the railways and near Konakry could give excellent results.

Rubber is yielded by *Funtumia elastica, Manihot Glaziovii, Hevea brasiliensis, Landolphia owariensis* and *L. Guineensis*. The law obliges the natives to replant the lianas. Heveas and the lianas (*Landolphia*) give the best rubber, which sells at 4*s* to 4*s* 8*d* per lb., while *Manihot Glaziovii* yields a fragile rubber and in smaller quantity. A new preparation is announced from Guinea: rubber in small slabs, which yields 98 per cent. of its weight industrial rubber.

Cotton is indigenous in French Guinea; it is grown, spun and woven by the natives of Middle and Upper Guinea. A French company has attempted to extend and to improve cotton growing among the natives of Lower Guinea, but the results were not very successful because the varieties introduced from Egypt and America were attacked by the boll-worm (*Heliothis obsoleta*) and other parasites. It appears, however, that better results would be obtained in Middle and Upper Guinea by selecting the native varieties.

Live stock. — The live stock is estimated to consist of about 2 000 000 head of cattle, 1 000 000 of sheep and 10 000 horses and asses.

The cattle of Upper Senegal-Niger are better and larger than those of Fouta, which however yield a better flavoured beef; the writer believes that crossing the two breeds would improve them. There is no farm school in which animal husbandry is taught; private initiative is completely wanting.

The writer believes that European experts could realize handsome profits in the live stock trade in Middle and Upper Guinea, provided that some farm schools be founded.

628 - The Agriculture of Mozambique Province, Portuguese East Africa. —

LYNE, R. N. in *Bulletin of the Imperial Institute*, Vol. XI, No. 1. pp. 102-110. London, January-March 1913.

The southern part of the Province of Mozambique, including Gazaland, may be classed as sub-tropical, and is suitable for cattle grazing and the cultivation of maize. The native pastures do not fail during the dry season as is the case with the high veldt, and the heavy breeds of cattle such as the Shorthorn and Friesland thrive and cross well with the native cattle; moreover the whole district south of the Limpopo river has been cleared of the East Coast fever. While it is estimated that one million head of cattle could be maintained on this area, it carries at present only about 5 per cent. of that number; but the district is undoubtedly destined to become an important producing centre in the cattle and dead meat industry of the world.

The greatest agricultural asset of the country is represented by the Landolphia rubber forests, and the question of their most profitable exploitation has been the subject of much discussion. It does not seem possible to manage them as plantations and probably the only practical and profitable method of obtaining the rubber is to cut down the vines, extract the rubber by machinery, and utilize the land for new crops. Ceara rubber has been established in the Quilimane district, where plantations are thriving, but south of the Zambesi the climate is not sufficiently moist for its cultivation.

Mozambique possesses excellent river systems and in the river valleys ideal conditions for sugar cane planting are met with. This fact is being realized, and the output of sugar, which was 30 000 tons in 1910, will have doubled itself by 1914. Oil-producing plants are of less importance than would be expected from the geographical position of the country: coconuts only flourish in a few coastal districts, and the seeds of *Trichilia emetica* (the source of the "mafura" tallow), which occur abundantly at Inhambane, command such a poor price on the market that it does not pay to collect them for export. Groundnuts too, though of excellent quality, will not repay the employer of labour to cultivate them.

Sisal hemp grows in all parts of the Province, and the abundance of running water which is essential for the extracting factories, as well as the rather dry soil and climate in many parts, make the prospects of profitable cultivation very favourable. Cotton has been tried and proved a complete failure, but the question requires further investigation before the crop is finally condemned. The outlook for tobacco on the other hand is most promising though the industry is still quite in its infancy.

On the whole, Mozambique may be said to be the country of the syndicate and of the steam plough; in only two places has close settlement been attempted. Out of the whole Province, and in fact out of the whole of East Africa, the district of Quilimane may be picked out for its remarkable fertility. It is traversed by 8 or 10 considerable rivers flowing with abundance throughout the year, and the soil, though varying in quality, is never poor. The land rises gradually from the coast, the rainfall is about 60 in. per annum and well distributed, and the climate is not unhealthy as African climates go.

629. — **Agriculture in German South-West Africa.** — GAD, JOHANNES in (*Deutsche Landwirtschaftliche Presse*, Year XL, No. 26, pp. 316-317. Berlin, March 29, 1913.

The natural conditions previling in German South-West Africa compel the settlers to devote themselves to live stock breeding on extensive lines, all other branches of agricultural production falling into the background. According to the official farm list, out of the whole extent of farmed land, about 26 770 000 acres, only 12022 acres or 0.045 per cent, were arable land. In the two districts most suitable for agriculture, Windhuk and Grootfontein, this percentage rises to 0.1 and 0.155 respectively.

The writer gives several reasons for the failure of the attempts hitherto made to extend agriculture: only a small proportion of the present settlers were farmers in their homes; the land really suitable for agriculture is limited in extent; the difficulties with which agriculture in the Colony has to contend have often been much undervalued. The small amount of rainfall, the brevity of the rainy season, the unequal distribution of the rains, the sudden frosts, the very numerous pests, form difficulties which can only be overcome by very intensive cultivation. Where small areas are cultivated with intensive methods, crops of 900 to 1800 lbs. of maize per acre are obtained ; where, however, greater areas are but roughly tilled, frequently only 45 to 90 lbs. are harvested.

With intensive cultivation the expenses reach £ 2 to £ 4 per acre, so that a crop of 900 to 1800 lbs. at about 11*s* per cwt. would yield a profit of £ 2 to £ 6 per acre. Even reckoning on one really good harvest, two average ones and one complete failure every four years, such intensive farming on a small scale is fairly remunerative. Wheat, oats and millet also promise good and sure harvests.

A further extension of this intensive cultivation is limited by the question of its profitableness. When the local consumption is provided for, the excess must be sold at the general prices of the great markets of the world, that is maize must be delivered at the port at 5*s* 6*d* per cwt. Now this seems impossible on account of the intensive tillage required, of the serious want of native labour and of the high railway tariffs. If the maize-producing northern district of the colony is to be able to compete in the south with the imports from Cape Colony and meet the wants of the country itself, it must have at its disposal sufficient cheap native labour and a lower railway tariff. The first step, however, is the prosperous development of the stock raising industry, which will give the necessary means for the establishment, in the course of time, of healthy farming in German South-West Africa.

630 – **The Island of Formosa.** DAUTREMER, JOSEPH in *Bulletin de la Société de Géographie Commerciale de Paris*, Vol. XXXV, No. 3, pp. 164-171. Paris, March 1913.

General information about the economic importance of this island, and the monopolies of opium, salt, camphor and tobacco. Also regarding the progress of the irrigation works and the rice production; the amount of rice at present exported to Japan is worth over 18 million frs. (£700 000). The cultivation of sugar cane is extending, and the value of the sugar now exported to Japan is 90 million frs. (£3 500 000). Tea, however, makes the largest export: green tea, « oulong », « souchong » and black tea are exported to the value of 17 or 18 million frs. The chief agricultural products, in addition to those already mentioned, are sweet potatoes, ramie, jute and indigo.

631 – **Agriculture in the "Altos" of Guatemala.** — SAPPER, KARL in *Der Tropenpflanzer*, Year 17, No. 4, pp. 191-199. Berlin, April 1913.

Notes upon the conditions of agricultural exploitation in western Guatemala : Climatic conditions, cultural methods and the chief crops grown (maize, wheat, lucerne, potatoes) are dealt with.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

632 – **Courses of Instruction and Lectures on Fruit, Vegetable and Flower Culture in Belgium.** — *Ministère de l'Agriculture et des Travaux publics, Bulletin de l'Agriculture et de l'Horticulture*, Year 2, No. 6-7, pp. 361-421. Brussels, 1913.

Last winter, in accordance with a Ministerial Decree of September 5, 1912, courses of instruction consisting of 20 lectures on fruit-growing were held in 22 places in Belgium and similar lectures on market gardening in 10 places. Series of lectures (generally 5 or 6 in number) were also given; of these the subject in 244 places was fruit-growing, in 242 market gardening, and in 61 flower-growing.

The Ministerial Decree contained a detailed curriculum both for the instruction courses, and for the series of lectures.

633 - **The Agricultural Curriculum at the Hamburg Colonial Institute.** — *Hamburgisches Kolonial-Institut und Allgemeines Vorlesungswesen, Verzeichniss der Vorlesungen im Sommerhalbjahr* 1913, pp. 6. Hamburg, 1913.

The course on colonial agriculture at the Hamburg Colonial Institute includes: agriculture, veterinary science, natural science, and rural economy; also optional attendance at all the other lectures and at the foreign language classes. The course lasts four terms, and at the conclusion the students may take an examination for a diploma for proficiency in Colonial agricultural knowledge.

634 - **The Establishment of a German School of Pisciculture at Eger.** — SCHUBERT, OTTOKAR in *Oesterreichische Fischerei-Zeitung*, Year X, No. 7, pp. 114-115. Vienna, April 1, 1913.

The Provincial Agricultural Council of Bohemia proposes establishing a German School of Pisciculture for the theoretical and practical instruction of pisciculturists and of the staff employed in fish-breeding establishments. The school in question will be at Eger, a town which offers every facility for the sale and despatching of fish, as well as for the practical work of fish-breeding.

635 - **The Royal Practical School of Agriculture at Todi (Perugia, Italy).** — *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year 12, Vol. 1, Series A, Part 9, pp. 231-253. Rome, March 1, 1913.

The organization (administration, teaching staff, regulations) and curriculum of the course, which extends over a period of four years.

636 - **Amalgamation of the Poultry Stations in South Australia.** — LAURIE, D. F. The Poultry Stations. Scheme of Amalgamation. — *The Journal of the Department of Agriculture of South Australia*, Vol. XVI, No. 7, pp. 784-786. Adelaide, February 1913.

The scheme for amalgamating the three existing Poultry Stations of Roseworthy, Kybybolite and Murray Bridge has been approved by the Minister of Agriculture and will be given early attention. There will now be one central State Poultry Station at Parafield, about 10 miles from Adelaide. Its objects will be to carry on the laying competitions and various food experiments. All experiments will be on a large scale, and breeding, incubation and other experiments will be carried out. Table-bird breeding will form a a special branch, and only proved breeds will be kept. A good revenue to pay for the work will be obtained by keeping some thousands of hens and pullets to supply market eggs.

A large building will be converted so as to provide two large incubation rooms. Two large brooder houses will be erected and yards laid out to provide accommodation for rearing chickens, breeding stock, experimental work, egg production, etc.

The new Poultry Station will afford excellent opportunities for teaching pupils the newest methods in poultry rearing and keeping.

637 – **Ruakura Farm of Instruction. A Digest of the Work of the Year.** — McConnell, Primrose in *New Zealand Department of Agriculture, Industries and Commerce, The Journal of Agriculture*, Vol. 6, No. 1, pp. 24-33. Wellington, January 15, 1913.

Numerous experiments were made, or continued, the subjects dealt with being as follows: 1) plant selection (cereals, turnips and mangels) and plant diseases; 2) forage plants for dairy-cows; 3) manuring (pastures, green-manuring); 4) fat lamb breeding, calf-rearing (raw crushed linseed seems equal to boiled or scalded as cream-substitute), treatment of stomach-worms in sheep. A lucerne paddock has been successfully established on swamp land. Numerous sittings of eggs of carefully selected poultry have been distributed. The Farm has also sent authentic exhibits and information to the various shows throughout the Dominion.

638 – **Regulation for the New Higher School of Agriculture and Veterinary Medicine in Brazil.** — *Diario Official, Estados Unidos do Brasil*, Year LII, No. 24, pp. 1473-1486. Rio de Janeiro, January 29, 1913.

The Decree No. 9857, dated November 6, 1912, approves the regulation (which is annexed to the decree) of the "Escuela Superior de Agricultura e Medicina Veterinaria" about to be instituted. Education in agriculture and in veterinary science will form two distinct courses for agricultural engineers and for veterinary surgeons. The special course for the former will last three years; for the latter four years. Each of them will be preceded by a preparatory course of one year.

An experimental field (Fazenda experimental) will be attached to the school. It will be devoted to the practical teaching of agriculture, animal husbandry and the chief rural industries, as well as to experimentation in the extensive and intensive methods of growing the industrial and forest plants of the country.

AGRICULTURAL INSTITUTIONS

639 – **The Great Agricultural Week in Paris.** — Hitier, H. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 3, pp. 462-472. Paris, March 1913

The Great French Agricultural Week was held in Paris from the 17th to the 24th of February. In this time the following Agricultural Associations held their general assemblies: Société des Agriculteurs de France, Association des Ingénieurs-agronomes, Société des Viticulteurs de France, Société de l'Industrie laitière, Syndicat des Fabricants de Sucre, Union Centrale des Syndicats des Agriculteurs de France, Syndicat Central des Agriculteurs de France.

A general Agricultural Exhibition was held at the same time; the different sections of the latter were as follows: fat stock, dairy produce, agricultural and horticultural produce, packing materials, and agricultural machinery.

The "Société des Agriculteurs de France" which has over 10 000 members and is divided into 14 sections, held sectional meetings every morning during the week and general meetings in the afternoons; the discussions were on technical, economic, and social questions connected with agriculture, such as mechanical ploughing, the employment of electricity in agriculture, the labour question, the housing of labourers, legislative regulation of labourers' pensions, home work. Amongst other decisions, the meeting resolved to devote 20 000 frs. (nearly £800) to making exhaustive trials with mechanical ploughs at Puiseux (Seine-et-Oise).

The "Société d'Encouragement à l'Agriculture" held a three-days' Congress for the purpose of discussing questions connected with the exportation of agricultural produce, the sale and exportation of cereals, cattle, pigs and pork, wine, fruit and fruit wines, olive oil, vegetables and flowers.

The chief result of the fat stock show was the proof afforded of the flesh-producing qualities of the Charolais cattle and the Craonnais pigs.

After briefly mentioning the exhibition of the products of agricultural industries, and the exhibition of the agricultural and horticultural products of Algeria, Tunisia, Morocco, the Mediterranean coast and the Rhone Valley organised by the P. L. M. railway, the writer gives some interesting information concerning the development in the trade in early vegetables and flowers from the South of France and Algeria; and the measures adopted by the above Company for the rapid despatch at low rates of this produce to the Parisian and foreign markets.

Over 160 makers of agricultural machines sent exhibits to the show; of these the motor ploughs and milking machines aroused the most interest.

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640 – Agricultural Shows.

Austria:

1913. Sept. 7-9. Kirchdorf a. d. Krems (Lower Austria). — Agricultural and Industrial Exhibition organized by the "Landwirtschaitlicher Bezirksverein in Kirchdorf."

Belgium.

1913. Sept. 7-9. Louvain. — Ornithological Exhibition. Sec.: M. Eug. Tant, 153, Rue de la Station, Louvain.

Nov. 15-17. Renaix. — International Show of the Renaix Pigeon Club. For information, address: M. O. Rose, Renaix.

Dec. 13-16. Liège. — Third International Show of Birds of all species, organized by the Liège Avicultural Society ("Scociété ornithologique"). For information, address to the Sec.: M. Ch. de Neeff, 46, rue des Mineurs, Herstal.

Denmark.

1913. Summer (opens June). Copenhagen. — General Cold-storage Exhibition, organized by the "Association des Industries." Address: Bureau of the "Association des In-Industries," Copenhagen.

France.

1913. July 16-19. Saumur. — Central Show organized by the "Société d'encouragement à l'élevage du cheval de guerre français" (Society for encouraging the breeding of French army horses).

Sept. 23-24. Saint-Quentin (Saint Lazare farm), Aisne. — Competition in mechanical beet-pulling, organized by the "Comice agricole" of the arrondissement of St. Quentin. Address, before Aug. 15, to the general sec.: M. Cardon, rue de Gouvernement, 36, Saint-Quentin.

October. Saint-Etienne. — Show of industrial inventions and novelties. Address to offices of the "Union des Inventeurs de la Loire," Hôtel de Ville, Saint-Etienne.

Oct. 24-Nov. 2. Paris, Cours-la-Reine. — General autumn horticultural show, organized by the "Société Nationale d'Horticulture de France".

Nov. 6-10. Bordeaux. — General autumn show, organized by the "Société d'Horticulture de la Gironde." Address, before Oct. 20, to the general sec.: M Morain, 10 rue Sainte-Catherine, Bordeaux.

Nov. 19-23. Moulins. — Poultry Show, organized by the "Société des Aviculteurs et Agriculteurs du Bourbonnais et du Centre." Address to the president: M. Buvat, 8, avenue Victor-Hugo, Moulins, Allier.

1914 May 1-Nov 1. Lyons. — International Urban Exhibition. Sections will be reserved for foods of animal origin in general, and for milk and its derivatives.

Germany.

1913. July 11-13. Corbach. — Agricultural Show for Waldeck and Pyrmont. Address to "Geschäftsstelle der Landwirtschaftskammer," Mengeringhausen.

Holland.

1913. June 26-July 10. Sittard. — International Exhibition of Industry, Commerce, Agriculture, Arts and Science.

Aug. 20-22. Kampen, Zandberg, Champ de Mars. — Agricultural Show, and annual meeting of the Agricultural Society of Gueldens and Overyssel.

Italy.

1913. September. San Vito al Tagliamento (Udine Prov.). — Cooperative Dairy Show, organized by the "Circolo agrario" and the "Cattedra ambulante di agricoltura" of San Vito al Tagliamento.

1914. Milan. — Exhibition of Cold, Heat and Light, on the occasion of the 50th anniversary of the founding of the Milan Polytechnic School.

1915. Melegnano (Milan Prov.). — Lombardy Agricultural Show.

Japan.

1913. October. Yokohama. — Japanese Agricultural and Industrial Exhibition, organized by the "Kwangyo Kyotai" (Industrial Association) of Yokohama. A section is devoted to products imported into Japan.

Autumn. Toyama and Kagoshima. — Provincial shows.

1914. Tokyo, Uyeno Park. — Exhibition organized by the Prefecture of Tokyo (under Government patronage). Foreign products will be admitted.

Norway.

1914. Christiania. — Norwegian Jubilee Exhibition ("Norges Jubileums-Utstilling"). Will include a permanent and temporary agricultural shows.

Panama.

1914. Jan. 21-May 31. Panama City. — National Exhibition on the occasion of the fourth centenary of the discovery of the Southern Pacific by Adelantado Vasco Nuñez de Balboa.

Peru.

1913. Nov. 1-Dec. 31. Lima. — International Exhibition of Hygiene. A section is devoted to food materials and non-alcoholic drinks. Entries close Oct. 20. Address to: "Presidente de la Commission Ejecutiva de la Exposición de Higiene", Academia de Medicina de Lima, Plaza de la Exposición, Lima, Peru.

Portuguese East Africa.

1913. October. Loanda. — Agricultural Show.

Russia.

1913. Sept. 5-8 (Aug. 23-26 old style). Mitau. — Agricultural Show organised by the "Kurländische Ökonomische Gesellschaft" of Mitau.

Spain.

1914. May (provisional date). Valencia. — Exhibition of agricultural machines, and especially machines for rice-growing and rice driers, on the occasion of the International Rice-Growers' Congress.

Switzerland.

1914. May 15-Oct. 15. Berne. — Swiss National Exhibition.

Tripoli.

1913. Autumn. Tripoli. — First Italian Industrial Exhibition. Includes a section for agriculture, colonisation and local industries. Offices: Via Maddalena, 15, Milan.

United Kingdom.

1913. Islington (London), Agricultural Hall. — Second International Exhibition of Chemical Industry, Engineering and Metallurgy. Organiser: F. W. Bridges, 124 Holborn, London, E. C.

Uruguay.

1913. Autumn. Montevideo, Prado. — General Agricultural Show, organized by the "Asociación rural del Uruguay."

641 — **Congresses.**

Austria-Hungary.

1913. June. Kaschau. — Congress of Hungarian Farmers, organized by the Hungarian Farmers' Society.

Belgium.

1913. Aug. 1-5. Brussels. — Third International Congress for the Study of Cancer, organized by the Belgian Commission for the Study of Cancer. Address to: Dr. Heuseval, Palais du Cinquantenaire, Brussels.

Sept. (early). Ghent. — Pomological Congress.

United Kingdom.

1914. Aug. 3-8. London. — Tenth International Veterinary Congress. Address of Organizing Committee for Great Britain and Ireland: Royal College of Veterinary Surgeons, 10 Red Lion Square, London, W. C.

CROPS AND CULTIVATION.

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ROLOGY

642 — **Weather Forecasting and Sun Spots.** — Poskin, P. Météorologie et Météorologie Agricole (Inaugural address for the Session 1912-1913 delivered at the State Agricultural Institute). — *Annales de Gembloux*, Year 23, Nos. 1 and 2, pp. 1-18 and 61-80, Brussels, February and March, 1913.

After a brief account of the present state of meteorological Science, and a short history of the development of the meteorological services in the different countries, the difficulties of accurate forecasts in Europe are dealt with, and shown to be due in part to the irregular course taken by the cyclonic disturbances, and in part to the lack of recording stations on the eastern side of the Atlantic Ocean. Long period forecasts, *i. e.* the average weather to te expected in the more or less distant future, are then discussed, the question being whether there exists any periodicity in meteorological phenomena, and if so what its fundamental cause may be.

While meteorologists are agreed on the fact that the primary cause of meteorological disturbances lies in the unequal distribution of heat over the earth's surface, opinions differ as to the latter's connection with solar phenomena. Sun spots have been observed since the time of Galileo and an examination of their records shows that their area — which is correlated with general solar activity — increases and decreases periodically, the interval between two maximum or minimum points varying from 8 to 14 years, with an average of 11.2 years. Besides this, there is exhibited a further periodicity of 33.6 years, that is to say that in every third period the maximum point is higher than the maximum points in the two intervening periods.

Nordmann, working with data from the tropics where the climate is very regular, plotted the variations of the annual mean temperature above or below the mean for the whole period (1870-1902). He then compared the curve thus obtained with the inverse curve of the frequency of the sun spots for the same period, and showed that there was a remarkable agreement between the two curves. In temperate regions with an irregular climate, this correlation is far less apparent but still exists. The writer, using data from Uccle, Belgium, for the period 1833-1912, plotted the differences between the monthly mean temperture for each month and the average temperature of the month over the whole period. The resulting curve is very irregular; usually one or two months above the average are followed by one or two months below the average; but from time to time, at intervals of 11 years, several hot months follow one another, and these periods of higher temperature correspond to periods of least solar activity. Data from Paris confirm the results in a general way, as do yet other data from S. Francisco, Sacramento, and San Diego.

Professor Douglass, working with old pine trees in Arizona, measured the radial thickness of the annual rings, and plotted the results. He remarked that there were specially high and specially low points in this curve every 32.8 years, with less marked points every 11 years (1).

The periodicity of seasons of high rainfall has been shown for Ceylon by Lockyer; for Mauritins, Port Louis, Brisbane, and Adelaide by Meldrum; for Central Europe by Brüchner, and in each case the periods are of approximately 11 or 33 years and correspond to periods of high solar activity. The rainfall data at Uccle were treated in the same way as the temperature data alluded to above; but they did not exhibit the regular periodicity of tropical rainfall.

A careful study of the curve, however, showed that periods of low solar activity and high temperature are also somewhat drier.

The records of the water level of the Swiss lakes have also been studied. Abnormally high levels with intermediate abnormally low levels have been recorded every 30 to 40 years from 1700 onwards.

Finally a close connection has been traced between an increase in area of the sun spots, and increased magnetic disturbances on the earth. (1

To summarise: though the correlation between solar phenomena and terrestial meteorological phenomena has not yet been completely worked out, it is a remarkable coincidence that a minimum solar activity should always be accompanied by a rise in temperature, a lowering of the rainfall and a reduction of electric and magnetic disturbances.

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(1) See also No. 224, B. March 1913. (Ed.).

643 - **Meteorological Conditions in a Field Crop, with a Description of two Simple Recorders.** — BALLS, W. L. in *Quarterly Journal of the Royal Meteorological Society*, Vol. XXXIX, No. 166, pp. 109-113. London, April 1913.

The experiments were carried out in a cotton field in Egypt and showed that the cotton plants lower the temperature and raise the humidity of the surrounding air to a considerable extent, even at night when transpiration is reduced. A gentle breeze immediately raised the temperature and lowered the humidity, and the particular interest of the phenomenon to the plant physiologist lies in the rise of tissue temperature and the consequent increased growth-rate of the plant which is thus produced.

Two of the instruments used in taking the observations were of the author's own devising: one of them was used for measuring low wind velocities and the other for recording clouds at night.

RICULTURAL
GEOLOGY

644 - **Classification of the Soils in Glaciated Regions according to Size of Particles and Physical Properties.** — FROSTERUS, BENJ. in *La Pédologie*, Year 14, No. 4, pp. 52-60. St. Petersburg, 1912.

After a short introduction explaining the use of the terms "Ablagerung" (earthy deposit) and "Boden" (soil), the writer, by means of tables giving the results of his soil investigations, shows that the mineral earthy deposits in glaciated regions are to be classified according to the size of their particles and their physical properties. In conclusion, he gives the type divisions of soil which should be indicated in field-mapping in Finland.

IL PHYSICS,
EMISTRY
AND
CROBIOLOGY

645 - **Osmosis in Soils, and Possible Applications of the Principle.** — 1. LYNDE C. J. Osmosis in Soils. Soils act as Semi-permeable Membranes. — *Journal of Physical Chemistry*, Vol. 16, No. 9, pp. 759-765 + 3 figs. December, 1912.
2. LYNDE, C. J. and BATES, F. W. — *Ibid.*, pp. 766-781 + 2 figs.

In the first article, the writer shows by means of experiments that a clay subsoil acts from the osmotic point of view as a semi-permeable membrane (*i. e.* allows free passage to the molecules of water, but not to those of the dissolved substances in a given solution) and that water is moved through the soil by osmotic pressure.

The experiments described in the second article were made with clay subsoils and with others containing a high percentage of sand and a low percentage of clay.

They showed that for sterilized clay subsoil in the presence of water: 1) the soil acts as a semi-permeable membrane; 2) the efficiency of a column of soil as a semi-permeable membrane increases with its depth; 3) water moves through the soil towards a solution and develops a certain osmotic pressure; 4) the osmotic pressure developed increases with the temperature.

This theory is only substantiated by the experiments in the case of a heavy clay subsoil prepared by settling out of suspension in hot water in a centrifuge. No osmotic pressure was developed when a sandy soil was used.

The theory is suggestive for agricultural practice in the following ways :

Tillage. — The different operations of tillage promote the growth of bacteria, which increase the concentration of the soil solutions in the upper layers of soil. This in turn increases the osmotic pressure of these solutions, and therefore increases the amount of water raised from the lower depths through the subsoil.

Drainage. — It is well known that crops on drained land receive more moisture than those on undrained land. This may be due to deeper root system, but it may also be attributable to the fact that, in drained land, the water level is lowered to a depth of 3 or 4 feet below the surface. This permits air to enter to this depth, which promotes the growth of bacteria ; the latter produce more soluble salts and these increase the concentration of the soil solutions and thereby the osmotic pressure, so that a larger amount of water is lifted from below through the subsoil.

Manure. — Experiments made by King show that in land treated with manure well worked in, the rise of water is stronger than in land not so treated. This cannot be due to a greater capillary rise, but appears to be attributable to the increased number of bacteria, which produce a larger amount of soluble salts ; this increases the osmotic pressure of the soil solutions near the surface and therefore the amount of moisture raised through the subsoil.

Mineral fertilizers. — When mineral fertilizers are added to the land, the concentration of the soil solutions near the surface is increased ; this increases the osmotic pressure of these solutions, and, according to the writers' theory, should increase the amount of moisture raised through the subsoil.

Increase of temperature. — The rise of water in the soil, in so far as it is due to osmotic pressure, is increased by a rise in temperature in various ways.

The soil mulch. — Under a soil mulch the land is moist and warm and the conditions are ideal for bacterial growth. Thus the osmotic pressure of the soil solutions is increased and more water is raised through the subsoil.

Dry farming. — In dry farming it is the practice in some cases to plant a crop every other year, and to maintain a mulch on the land in the off year. The writers' theory suggests that the increased crop the second year is partly due to the increase in the osmotic pressure of the soil solutions near the surface owing to bacterial action, as explained under "soil mulch" above.

This theory opens up a large field for investigation in soils ; Amongst the questions for solution are the following :

1) Do soils other than clay subsoil act as semi-permeable membranes ?

2) Does the efficiency of a soil as a semi-permeable membrane depend upon the percentage of clay it contains ? If so, how ?

3) Do soils under field conditions act as semi-permeable membranes ?

4) Do the operations of tillage increase the amount of water raised through the subsoil ?

5) Are there substances, other than those at present known, which are not plant foods, but which can be used as fertilizers with benefit from the point of view of their action on the osmotic pressure of the soil ?

646 – **The Partial Sterilization of Soil and the Nature of the Limiting Factor of Bacterial Development.** — RUSSELL, E. J. and HUTCHINSON, H. B. (Rothamsted Experimental Station) in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 152-221 + 7 figs. Cambridge, March 1913.

The writers have by these further experiments confirmed and extended the results reached in their previous paper (1). Fresh evidence is adduced that bacteria are not the only inhabitants of the soil, but that another group of organisms occurs, detrimental to bacteria, multiplying more slowly under soil conditions and possessing lower power of resistance to heat and to antiseptics.

In consequence of the presence of these detrimental organisms, the number of bacteria present in the soil at any time is not a simple function of the temperature, moisture content and other conditions of the soil. It may indeed, show no sort of connection with them ; thus rise of temperature and increase of moisture content are found to be ineffective in increasing the bacteria in the soil. The number of the latter depends on the difference of activity of the bacteria and the detrimental organism.

Partial sterilization leaves the former unharmed, but kills the latter, as do antiseptic vapours or the heating the soil to 55 or 60° C. Whenever the treatment is sufficiently energetic to kill the bacteria, these micro-organisms rapidly increase as soon as the soil conditions are made normal. Once the detrimental organisms are killed, however, the only way of introducing them again is to add some of the untreated soil, but the precise conditions governing the transmission are unknown.

The writers provisionally identify the detrimental organisms of the soil with the active protozoa of the latter, but as the zoological survey is yet incomplete, they do not commit themselves to any definition of the term protozoa, nor to any particular organism, or set of organisms.

As there is a great diversity of opinion on this point (2) it may be well to mention some of the experiments made by the writers, who in all their sterilization operations, always sought for and obtained protozoa. The soil is inoculated into a one per cent. hay infusion and left in an incubator at 25° C for 4-5 days, examination being made periodically for protozoa ; these are roughly grouped as ciliates, amoebae, and monads. Partial sterilization simplifies the fauna considerably, killing the ciliates and amoebae but often leaving certain monads. Whenever the ciliates and amoebae were killed, the investigators invariably found that the detrimental factor was extinguished ; whenever the detrimental factor was not extinguished, the protozoa also were not killed.

The following are typical results for heated soils :

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(1) See No. 14, *B.* Jan. 1913.

(2) See No. 467, *B.* May 1913. (*Ed.*).

	Bacteria after 68 days. Millions per gram of dry soil	Ammonia and nitrate formed after 68 days. Parts per million of soil	Detrimental factor	Protozoa found
Untreated soil	11.1	13	present . .	ciliates amoebae monads
Heated to 40° for 3 hours .	7.5	14.4	present . .	ciliates amoebae monads
Heated to 56° for 3 hours .	37.5	36.7	killed . . .	all killed

Treatment with toluene leads to similar results:

	Bacteria after 30 days. Millions per gram	Ammonia and nitrate formed after 30 days	Detrimental factor	Protozoa found
Untreated Soil	8	24.5	present . .	ciliates amoebae monads
Toluened soil.	47.4	41.6	killed . . .	all killed but certain monads

Quicklime also produces the same effect.

As the writers' methods of dealing with soil protozoa do not reproduce conditions in the soil, they abstain at this stage from laying too much stress on any relationship that comes out, but which may only be accidentally between their detrimental organisms and any of the ciliates, amoebae and monads that their methods reveal. But it seems safe to draw two conclusions: 1) the detrimental organisms possess the properties of protozoa and not of bacteria; 2) the presence or absence of the detrimental organisms is intimately associated with the presence or absence of a complex protozoan fauna.

The increase in bacterial numbers following after partial sterilization by volatile antiseptics is accompanied by an increase in the rate of ammonia production until a certain amount of ammonia and nitrate has accumulated, when the rate falls. Thus two cases arise: 1) when only small amounts of ammonia and nitrate are present, there is a relationship between bacterial numbers and the rate of ammonia production; 2) when large amounts of ammonia, or of ammonia and nitrate, are present there is no such relationship. The limit varies with the composition and condition of the soil.

Complications are introduced when the soil has been partially sterilized by heat, as the organic matter is decomposed and some of the bacterial varieties are exterminated. These effects become more and more pronounced as the temperature increases; the maximum number of bacteria are found in soils which have been heated to 60° C, while this is the minimum temperature necessary to kill the detrimental organisms.

At this temperature, we have the same relation between the two sets of organisms as obtains when the soil is treated with volatile antiseptics. Although bacterial numbers are at a minimum in soils heated to 100° C, the decomposition effected is at a maximum. With this exception, it is generally true that bacterial multiplication may go on without increasing the production of ammonia, but an increase in the rate of production of ammonia does not take place without bacterial multiplication.

The increase in bacterial numbers brought about by addition of bacteria from the untreated soil into partially sterilized soil leads to still further production of ammonia and nitrate, unless too large a quantity of these substances is already present. But the subsequent depression in bacterial numbers consequent on the development of the detrimental organisms is generally (though not always) without effect on the rate of decomposition, apparently because it does not set in until too late.

ERMANENT
ROVEMENTS,
INAGE AND
RIGATION

647 - **Irrigation on the Southern Side of the Pyrenees.** — DE CONTENSON in *Revue Économique Internationale*, Vol. I, No. 1, pp. 76-95. Brussels, January 15-20, 1913.

There are large tracts of fertile soil in Northern Spain which are rendered unproductive by lack of water, and with the mountain range close at hand and a proper utilization of its water resources, much might be done in the way of reclamation.

The Royal Irrigation Company of the Ebro Agricultural Syndicate has been established 19 years, and during that period the receipts for irrigation water have risen from £2106 in 1892 to £11 713 in 1910, forming 93 per cent of the total receipts at the latter date. The success of this company induced Sr. Romana to formulate a project for an immense system of water canalization which is to reclaim 300 000 hectares (740 000 acres) in Upper Aragon at a cost of 535 pesetas per hectare (£ 8 11s per acre).

The region covered consists of gentle slopes and wide plains with a gradual fall of about 1180 feet. At present it is estimated that 4000 hectares (nearly 10 000 acres) receive some irrigation of an irregular and unreliable kind, 196 000 hectares (484 300 acres) are unirrigated but produce meagre crops of cereals or are planted to a small extent with vines or olives, and 100 000 hectares (247 000 acres) are altogether uncultivated. The production is uncertain, and in periods of drought the population must either emigrate or starve. The value of the ground in this area may be stated as follows :

	Millions of pesetas	
4 000 hectares with irrigation at 1 500 pes. per ha. (£ 24 p. acre)	4	(£ 160 000)
196 000 hectares not irrigated, but cultivated, at 450 pes. per ha. (£7 4s p. acre)	88	(£ 3 520 000)
100 000 hectares uncultivated at 100 pes. per ha. (£ 1 12 s p. acre)	10	(£ 400 000)
Total . . .	102	(£ 4 080 000)

With a reliable water supply its value would be :

	Millions of pesetas	
230 000 hectares suitable for cereals at 500 pesetas per ha.	345	(£ 13 800 000)
70 000 » » for intensive cultivation at 3 000 pes. per ha. (£ 48 p. acre)	210	(£ 8 400 000)
Total . . .	555	(£ 22 200 000)

Even when the cost of the undertaking is deducted, a profit of over 500 pes. per ha. (£6 3s per acre) is obtained; further it is estimated that the annual gross returns will increase from 69 to 349 pes. per hectare (17s to £4 12s per acre). The annual rainfall varies from 8 to 20 inches, but as it is regular and evenly distributed an allowance of 8 in. of irrigation water would be sufficient to secure the cereal crops.

A description is given of a very successful piece of reclamation carried out on a small scale by a landlord in the zone of the Aragon-Catalogna Canal. The water has been brought 5 ½ miles from the main canal, and, in order to provide the necessary labour for the scheme, a small farm colony or model village has been established. The landlord bears all the expense of settling in the tenant or colonist, and of stocking the holding, and receives in return one half of the yields of corn and forage at harvest. The colonists, in addition to cultivating their holdings, undertake to reclaim a certain additional amount of fresh land every year. The contracts are entered into for six years, but any time previous to their expiration the tenant may pay back the expenses incurred on his behalf, and in that case a fresh arrangement is made, by which the tenant retains four-fifths instead of one half of his harvests. Though the system has only been working for three years, already half the loans have been repaid.

With regard to method of cropping, as well as in all other questions of farm management, the landlord reserves the right of imposing his rules on the tenant. The reclamation of land is encouraged by paying a fair price (40 *s* per acre) for all work done by the tenant over and above his contract and, further, the landlord himself reclaims 18 to 20 hect. (44 to 49 acres) every year. In this way 200 hect. (494 acres) of barren land have been brought under cultivation at a cost varying from £ 5 8 *s*, per acre where the landlord himself bears the cost of the labour, to £ 4 per acre where the colonists supply the labour; profitable employment has been provided for several families, numbering in all 24 individuals; and the success of the experiment has induced other landlords to initiate similar systems on their estates, so that as the possible irrigation zone of the canal is 100 000 hect. (247 000 acres) it seems safe to predict that the population of the district will shortly increase to five times its present numbers and will more than justify the expenses incurred by the Government in the construction of the canal.

648 – **The Experimental Drainage Field at Josephsdorf, Germany.** — Krüger, E. in *Mitteilungen des Kaiser Wilhelm Instituts für Landwirtschaft*, Vol. VI, Part 3, pp. 173-185. Berlin, February 1913.

As is well-known, the beneficial effect of drainage is not only due to the removal of the superfluous water, but also to the subsequent aeration of the soil. Mierau in 1890, followed first by Klinkert, and recently by Friedersdorff, Holdefleiss and Heinze, showed the importance of studying aeration on experimental fields; but unfortunately no observations have been made on the effect of such aeration.

Other points in draining which are of no less consequence are the depth and distance apart of the drains. It is surprising that the exact solution of a question of such great economic importance has been so long deferred. Kopecky was the first to show that the distance between the drains must be determined as a function of the mechanical composition of the soil and of the amount of water to be removed. He advocated therefore the mechanical analysis of the soil as a basis of drainage operations; his suggestion was followed and further developed by Fauser and Canz. Recently Breitenbach has tried to deduce from the hygroscopicity of the soil the right distances at which to place the drains (1).

Since the introduction of drainage the question of the most suitable depth for drains in heavy clays has been the subject of the keenest discussion.

There is no doubt that the solution of all these questions is of paramount practical importance. The Minister of Agriculture for Prussia, being convinced of this fact, transmitted, in 1908, Mierau's proposition to the Section of Agricultural Improvements, and entrusted the latter with the task of laying out an experimental field for the purpose of solving all these problems.

After a prolonged search, a field suitable for the purpose was found at Josephsdorf in the district of Culm, which its owner, Hr. Plehn, consented to lend for a period of 10 years. According to the project, the following points are to be studied:

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(1) See No. 1271, B. Sept. 1912. (Ed.)

1) Drainage with drains situated at different distances apart: 52, 40 and 26 ft.

2) Drainage at different depths : 5 ft., 4 ft. and 3 ft.

3) Drainage with and without aeration.

There are thus 18 variants.

The aim of the drainage experiments is the solution of the following questions : the influence of the variants on *a*) the production; *b*) the properties of the air circulating in the soil; *c*) the amount of water removed; *d*) the rapidity with which the rain water reaches the drains; *e*) the development of plant roots; *f*) the mechanical modifications of the structure of the soil.

These are the bases on which the project was elaborated, and the work was begun in March 1911. The field has an area of 8 $^3/_4$ acres ; the cost of preparation amounted to £ 97.

As the drainage works have only been one year in operation, it is necessarily impossible as yet to give any experimental results.

649 – **The Best Cross- Section for Ditches in Drainage Operations.** — SCHÖNFELDT, A. in *Der Kulturtechniker*, Year XVI, No. 2, pp. 130-134. Breslau, April 1, 1913.

In making intakes for water, and supply and drainage channels, which operations are the most costly items in irrigation and drainage work, it is necessary not only to take into consideration the quality of the work, but also the question of the financial and commercial basis of the latter. This question can only be solved in a satisfactory manner, when the increased production due to the work not only defrays the depreciation and upkeep expenses, but also permits of the formation of a reserve fund, *i. e.* when the interest on the capital expended is at least 5 per cent.

Thus in the choice of section it is necessary, apart from theoretical considerations, to have some idea of the relation between the cost and the section, and to choose the smallest form of section which (with the existing fall) will ensure the amount of water required. The formulae of Ganguillet and Kutter are generally employed in making these calculations. From the examples mentioned by the writer it appears that the semicircle where the surface of the water flows through the centre of the circle presents the smallest section. Unfortunately this form of section cannot be used and it is necessary to change the semicircle into a trapezoid in order to reconcile theory and practice.

650 – **The Effect of Loosening the Subsoil on Yield.** — AUGSTIN in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 32, pp. 303-304. Berlin, April 19, 1913.

TILLAGE AND METHODS OF CULTIVATION

In loosening the subsoil, as well as in the construction of subsoiling implements, two tendencies have to be sharply distinguished: one strives to loosen as much as possible of the subsoil to the same depth by means of the broadest possible implement, and without mixing the loosened subsoil with the upper layer ; the other endeavours to cut by means of a spring chisel-shaped subsoiler the deepest possible groove about 1 $^1/_4$ inch wide in the bottom of the furrow, with the result that a part of the loosened subsoil falls again into the groove, while the greater part in a state of fine division gets mixed with the upper layer. In order to investigate the relative ad-

A. *Ziechau Experiment Field.*

Lochow's yellow oats.

Plot	Yield per plot of 5/16 acre		Average yield per acre	
	Grain	Straw	Grain	Straw
	lbs.	lbs.	lbs.	lbs.
I. Shallow ploughing	770.5	971.3	2391	2961
V. Duplicate	706.5	858.8		
II. Shallow ploughing with groove subsoiling	723.1	1040.8	2444	3300
VI. Duplicate	787.0	998.9		
III. Shallow ploughing whith subsoiling of whole width	703.2	917.3	2244	2787
VII. Duplicate	683.4	804.8		
IV. Deep ploughing	723.1	829.1	2264	2731
VIII. Duplicate	675.7	858.9		

vantages of the two systems and to compare the effects of deep and shallow ploughing, the writer conducted some cultivation experiments at Friedeberg and at Zieckau in the autumn of 1911, on two fields each 1 hectare (2.47 acres) in extent. At Friedeberg the soil of the experiment field is a sandy loam with similar subsoil; at Zieckau, it is a slightly humous and loamy sand with compact loamy sand as subsoil.

At Zieckau only oats were grown; at Friedeberg half of the area bore oats and the other half barley. The various plots, save for the ploughing, were all of them treated in exactly the same way. The results are shown in Tables A and B.

From these experiments it appears that under some circumstances shallow tillage is more profitable than the more extensive loosening of the subsoil. The richer the upper layer, and the better, more compact and richer the subsoil, the greater success will attend the loosening of the subsoil. Making a groove in the bottom of the furrow requires much less expenditure of power than loosening the subsoil ower the whole width of the furrow with a broad subsoiler, so that even with an equal yield the first method would be preferable; but the experiments show that in two cases out of three the plots with the grooves cut in the bottom of the furrow yielded more than the plots in which the whole of the subsoil had been loosened. It is probable also that the effects of the first method last longer on account of the solid balks of earth which remain and support the upper layer and prevent the loosened subsoil being compressed again too soon.

B. *Friedeberg Experiment Field.*

1. *Original Ligowo oats.*

Plot	Yield per plot of $^5/_{32}$ acre		Average yield per acre	
	Grain	Straw	Grain	Straw
	lbs.	lbs.	lbs.	lbs.
I. Shallow ploughing	425.5	487.3	2680	3133
V. Duplicate	402.3	481.8		
II. Shallow ploughing with groove subsoiling	459.7	521.5	2876	3331
VI. Duplicate	428.8	511.6		
III. Shallow ploughing with subsoiling of whole width	437.6	505.0	2933	3347
VII. Duplicate	468.5	529.2		
IV. Deep ploughing	394.6	476.3	2904	3340
VIII. Duplicate	502.7	554.6		

2. *Original Bethges II barley.*

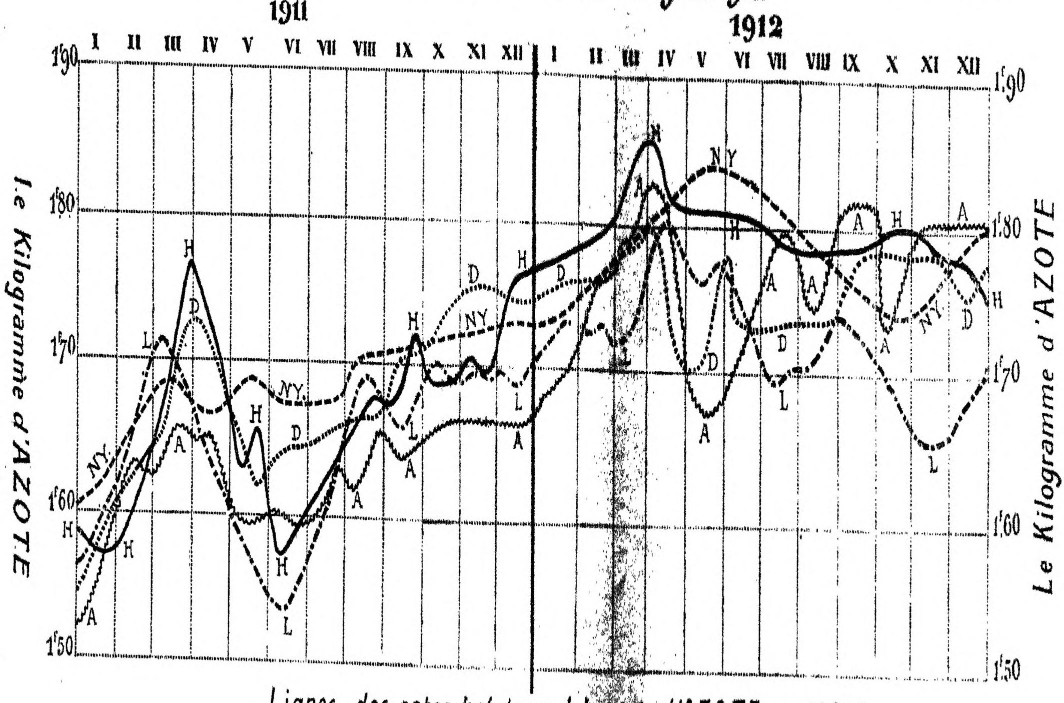
Plot	Yield per plot of $^5/_{32}$ acre		Average yield per acre	
	Grain	Straw	Grain	Straw
I. Shallow ploughing	377.1	426.5	2469	2858
V. Duplicate	387.0	458.6		
II. Shallow ploughing with groove subsoiling	384.8	457.5	2590	3468
VI. Duplicate	401.3	503.8		
III. Shallow ploughing with subsoiling of whole width	368,2	435.5	2490	3011
VII. Duplicate	402.4	496.1		
IV. Deep ploughing	340.7	406.8	2462	3040
VIII. Duplicate	421.2	532.5		

The writer, wishing to investigate the question thoroughly, will repeat these experiments for several years and will include in them experiments on the moisture and bacterial content of the soil.

651 - The Possibilities of Profitable Cultivation in the Dry Districts of Ceylon. — FERNANDO, H. M. (A paper read at the meeting of the Ceylon Board of Agriculture). — *The Tropical Agriculturist*, Vol. XL, No. 2, pp. 100-102. Colombo, February 1913.

Ceylon may be divided into three zones : the moist and dry low country areas, and the hill country. Leaving the hill country aside, the moist low country area which is situated in the south-west of the island is where the perennal crops (coconut, tea, rubber, etc.) are cultivated ; the dry low-

A.BERTRAND_ *Le Marché de l'Azote en 1911 et 1912* **GRAPHIQUE V**



Lignes des cotes hebdomadaires de l'AZOTE en 1911/12
à Dunkerque (D), Anvers (A), Liverpool (L), Hambourg (H) et New-York (NY)
en SULFATE d'AMMONIAQUE

DIAGRAM 3. — Weekly prices of nitrogen in 1911-12 at Dunkirk (D), Antwerp (A), Liverpool (L), Hamburg (H) and New York (N Y).

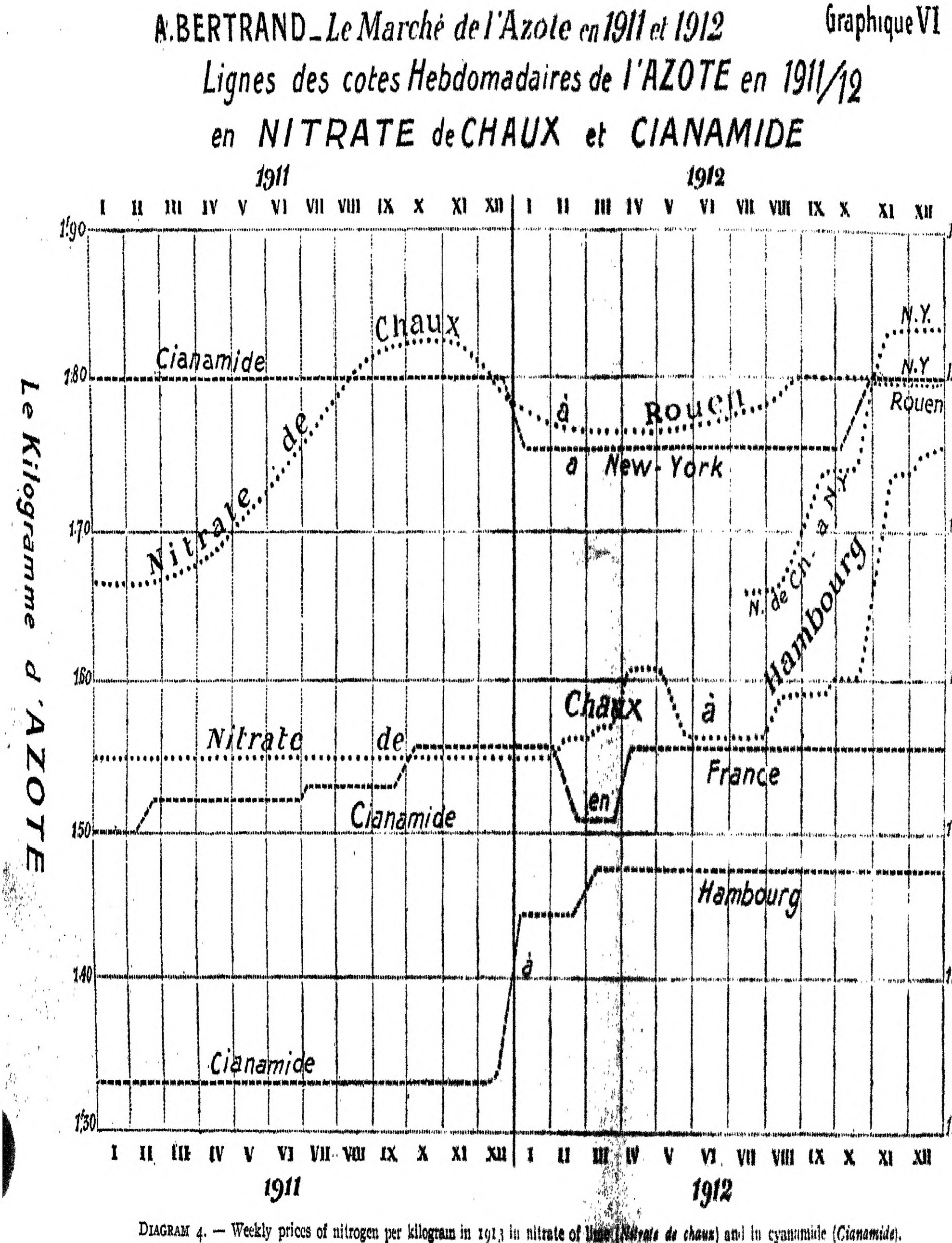


DIAGRAM 4. — Weekly prices of nitrogen per kilogram in 1913 in nitrate of lime (*Nitrate de chaux*) and in cyanamide (*Cianamide*).

A.BERTRAND — *Le Marché de l'Azote en 1911 et 1912* GRAPHIQUE VII

LIGNES MOYENNES

des cotes mondiales de l'**AZOTE** nitrique et ammoniacal

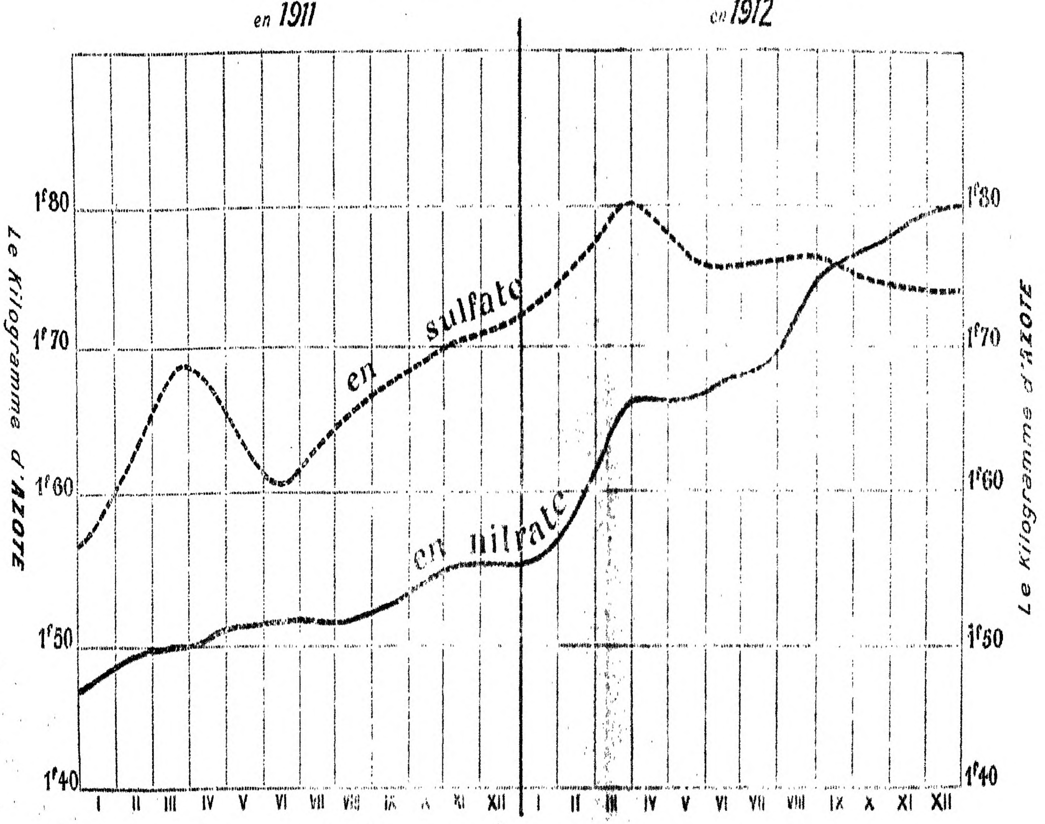


DIAGRAM 5. — Ranges of average prices of kilogram of nitrogen in sulphate of ammonia (*en sulfate*) and in nitrate of soda (*en nitrate*).

A. BERTRAND _ *Le marché de l'Azote en 1911 et 1912*

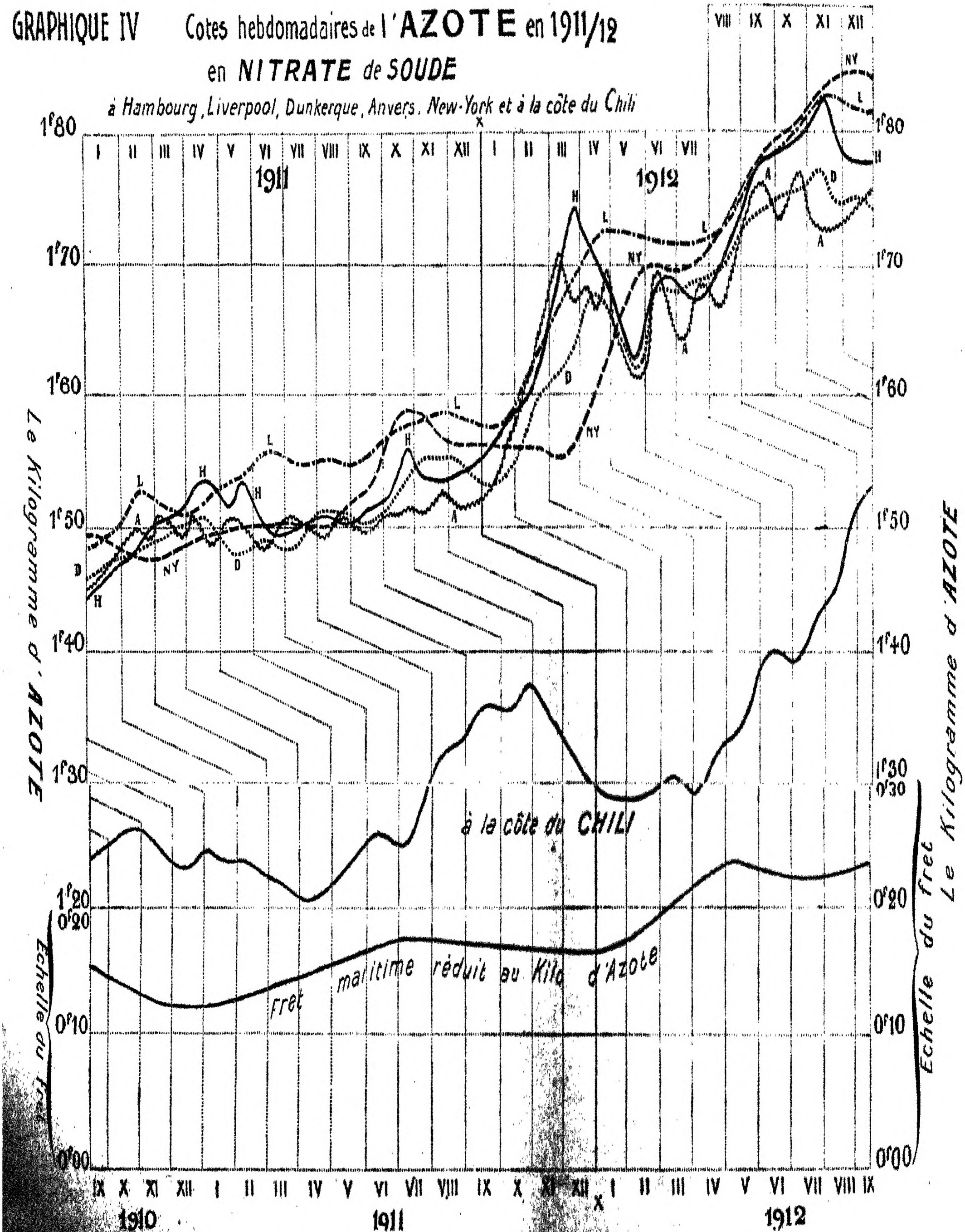

GRAPHIQUE IV Cotes hebdomadaires de l'**AZOTE** en 1911/12
en ***NITRATE*** de **SOUDE**
à Hambourg, Liverpool, Dunkerque, Anvers, New-York et à la côte du Chili

DIAGRAM 2. — Weekly prices of nitrate of soda per kilogram of nitrogen in the principal European ports, on the coast of Chile, and freights (*Frêt maritime*) reduced to kilogram of nitrogen. H, Hamburg; L, Liverpool; D, Dunkirk; A, Antwerp; NY, New York.

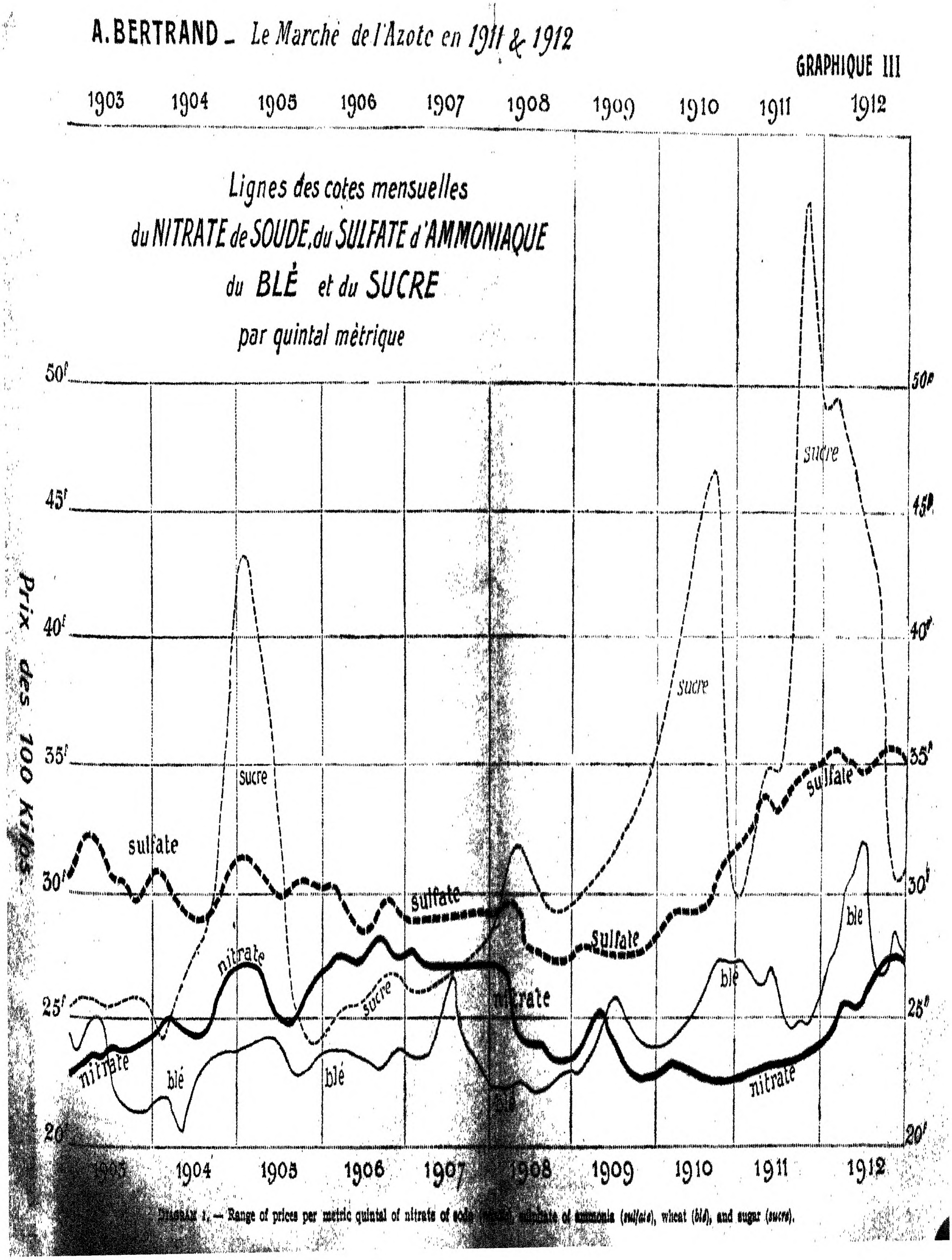


DIAGRAM 1. — Range of prices per metric quintal of nitrate of soda (nitrate), sulphate of ammonia (*sulfate*), wheat (*blé*), and sugar (*sucre*).

land area, which occupies more than half the island, remains for the most part either impenetrable jungle or barren waste, except where irrigation water exists or special conditions of underground water obtain. The rainfall on this dry zone is seldom less than 40 inches and frequently rises to 50 inches, the major part of which falls in the months October-January. This period is followed by a drought, then by a few gentle uncertain rains in April-June, and a further drought.

The chief difference between the dry and the moist area, therefore, lies in the failure of the south-west monsoon over the former; in spite of this, the rest of the rainfall is sufficient to raise one crop per annum, and native cultivators do use it to a certain extent for the production of grain under a very primitive system of agriculture. But with the introduction of dry farming methods, the production of other and more valuable crops should be possible.

Of these, two are suggested as specially suitable — the one being fodder to take the place of the large quantities of hay imported from Australia, and the other cotton, which could be planted in October, grow with the rains, and ripen during the unfailing drought of February and March. Preliminary trials indicate that both these crops would be quite successful, but more evidence is required before they can be recommended with confidence, so that the necessity of starting experimental farms in the dry districts is quite evident.

MANURES AND MANURING

652 - **The Price of Nitrogen.** — BERTRAND, A. (Delegate for the Nitrate of Soda Service in Europe). Le Marché mondial de l'azote en 1911 et 1912. Rapport présenté au Ministre des Finances du Chili. – Reprinted from *L'Engrais*, of March 14 and 21, 1913, pp. 12 + VIII graphs. — 2. BRADBURY and HIRSCH'S *Review of the Market for Sulphate of Ammonia during* 1912, pp. 37 + 3 tables. London. — 3. Revue commerciale de la Semaine. — *Les Mercuriales Agricoles*, *passim*. Antwerp, 1913.

Recently there has been a general rise in the markets of the prices of fertilizers and especially of nitrate of soda. In fact the prices of nitrate of soda have risen since 1910 and lately have come very near the highest quotations of 1906, that is the time of the so-called nitrogen crisis (1).

According to M. Bertrand the increase in the price of nitrogen, which before 1906 was attributed to nitrate of soda, should now be attributed to sulphate of ammonia, admitting the manurial equivalence of nitric and ammoniacal nitrogen. The increase in the price of nitrogen is, however, considered by M. Bertrand as a special manifestation of the increased prices universally observed and recognised for all the staples of international trade. And if such general rise is due to the diminished purchasing power of gold and to the extent of 30 per cent. between 1910 and 1912 (J. Fisher, *Quarterly Journal of Economics*, Jan. 1913), starting from the price of 10*s* 1*d* per cwt., considered as the normal price of nitrate in 1910, M. Bertrand thinks that the present price of 11*s* 3 ½*d* is still within normal limits.

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(1) See: *Production et consommation des engrais chimiques dans le monde*, International Institute of Agriculture, 1913. (*Ed.*)

In confirmation of the above he shows in diagram 1 the fluctuations in the price of sulphate of ammonia and of nitrate of soda compared with those of sugar and of wheat (1).

Diagrams 2, 3, 4 and 5 show sufficiently the details of the oscillations ni the price of nitrogen in its various forms during 1911 and 1912.

On the above diagrams, M. Bertrand makes the following observations:

a) The lines representing the prices in the various markets of consumption do not deviate so much from each other, while their parallelism with the line representing prices on the coast of Chile is less regular.

b) The yearly rise in the price of nitrate of soda which takes place at the season of consumption was less accentuated during the last two years than in the preceding years.

c) The irregularities and deviations in the sulphate of ammonia markets are relatively more marked.

d) According to diagram 4, it appears that nitrate of lime has a tendency of its own towards an increase in price.

e) In cyanamide, the unit (one kilogram per quintal) of nitrogen is, in Europe, from 1*d* to 1 ½*d* cheaper than in the other nitrogenous fertilizers: in the United Stated the reverse seems to be the case.

f) Diagram 5 shows that nitrate of soda, referred to the kilogram of nitrogen in part at least, has resumed higher quotations than sulphate of ammonia.

The following figures, taken from Messrs. Bradbury and Hirsch's *Review of the Markets for Sulphate of Ammonia during* 1912, will assist in giving an idea of the present conditions of the nitrogen market.

Average prices of nitrate of soda, 1903-1912,
in Liverpool, 95 *per cent., per cwt.*

	s	d		s	d
1903	9	6 ½	1908	10	2 ½
1904	10	2 ½	1909	9	9
1905	10	9 ½	1910	9	4 ½
1906	11	4	1911	9	10 ¾
1907	11	2	1912	11	1

1912.

Jan.	10	0 ¾	July	11	0
Feb.	10	4 ½	Aug.	11	3
March	10	10 ½	Sept.	11	5 ¼
April	11	0 ¾	Oct.	11	6 ¾
May	11	0 ¾	Nov.	11	9
June	11	0	Dec.	11	7 ½

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(1) M. Bertrand has kindly permitted us to reproduce these diagrams. (*Ed.*)

Average prices of sulphate of ammonia, 1903-1912, *good grey 24 per cent. f. o. b. Hull., per ton.*

	£	s	d		£	s	d
1903	12	9	2	1908	11	12	0
1904	12	3	8	1909	11	5	0
1905	12	10	9	1910	12	3	2
1906	12	0	9	1911	13	15	3
1907	11	15	8	1912	14	7	9

1912.

	£	s	d		£	s	d
Jan.	14	7	2	July	14	3	9
Feb.	14	8	1	August	14	7	0
March	14	11	3	Sept.	14	8	5
April	14	19	1	Oct.	14	2	2
May	14	14	1	Nov.	13	17	0
June	14	11	3	Dec.	14	3	5

Messrs. Bradbury and Hirsch recognise the exceptional rise in freight rates, which resulted in an advance of about 50 per cent. in nitrate of soda freights, causing an increase of prices in Liverpool of 6 ¼*d* more than on the Chile coast, but still leaving an ample margin for the producers. Messrs. Bradbury and Hirsch believe that the price of sulphate of ammonia depends at present upon the capacity of the German market to cover the offers of the producers; should it fail to do so, these would be obliged to have recourse to foreign markets.

The following figures based on the wholesale prices at Antwerp are taken from the *Mercuriales agricoles.* They indicate the present trend of the market.

	Price per kilogram (2.2 lbs.) of nitrogen	
	End of January 1913 frs.	End of April 1913 frs.
Nitrate of soda	1.82	1.65
Sulphate of ammonia	1.78	1.64
Calcium cyanamide	1.57	1.57
Nitrate of lime	1.76	1.82

653 - **Experiments with Phosphatic Manures in Uruguay, 1907-1912.** - SCHRÖDER, J. (Agricultural Institute of Montevideo) in *Revista de la Asociación Rural del Uruguay*, Year XLII, No. 2, pp. 94-98. Montevideo, February 1913.

A question which is at present very important for the agricultural economy of Uruguay is that of the use of manures. The analysis of the soils shows a relative poverty of phosphoric acid (for instance, from 0.03 to 0.05 per cent. P_2O_5 soluble in 25 % hydrochloric acid). These experiments are specially important from the fact that they have been made under a sub-tropical climate and with the phosphatic by-product of the

Fray Bentos meat factories (bone meal, bone ash, guano) in comparison with basic slag and superphosphate.

Results of the Experiments.

		Crop per acre grain lbs.	Increase per acre grain lbs.	
Maize (1908)				
Without manure		3381	—	
Bone meal		4426	1045	
Guano		4669	1289	
	Roots lbs.	Dry matter lbs.	Dry matter lbs.	
Mangolds (1909)				
Without manure	14 698	1 793	—	
Bone meal	49 247	5 135	3 342	
Superphosphate	43 715	4 384	2 590	
Basic slag	43 403	4 749	2 956	
	Straw lbs.	Grain lbs.	Straw lbs.	Grain lbs.
Rye (1910)				
Without phosphatic manure	2 855	713	—	—
Bone meal	3 212	981	357	268
Bone ash	3 301	1 070	446	357
Superphosphate	3 301	981	446	268
		lbs.	lbs.	
Potatoes (1911)				
Without phospatic manure		4907	—	
Bone meal		5799	892	
Superphosphate		5977	1070	

A special experiment was conducted on plots of 63 sq. yards with rye, for the comparison of bone meals of various degrees of fineness :

	Crop Straw lbs.	 Grain lbs.	Increase Straw lbs.	 Grain lbs.
Without manure	35.20	9.35	—	—
Bone meal, commercial	38.50	11.99	3.30	2.64
» coarse	38.50	10.78	3.30	1.43
» fine	42.90	13.75	7.70	4.40
» very fine	41.58	13.64	6.38	4.29
Bone ash,	41.25	13.31	6.05	3.96
Superphosphate (Lawes)	44.00	12.76	8.80	3.41

These results confirm the usefulness of phosphatic manures for the soils of Uruguay. The differences observed are within the limits of experimental error. Only coarse bone meal has given, during the first year of the experiments, inferior results, thus corroborating the evidence already obbtained in other places as to theinfluence of the fineness of the meal used.

RICULTURAL
BOTANY.
CHEMISTRY
AND
YSIOLOGY
OF PLANTS

654 - Calcium as an Antitoxin to Certain Nutritive Salts in Water-Cultures of Peas and Lupins. — ROBERT, C. in *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 11, pp. 915-918. Paris, March 17, 1913.

Pea seedlings, after having been started in pure distilled water (*i. e.* redistilled over glass) were transferred to the following solutions :

1) Magnesium sulphate, $MgSO_4$	250 mg. per litre
2) Potassium phosphate, H_2KPO_4	500 mg. per litre
or potassium sulphate, K_2SO_4	containing an equivalent amount of K
3) Ammonium nitrate, NH_4NO_3	500 mg. per litre
or ammonium sulphate, $(NH_4)_2SO_4$ . . .	containing an equivalent amount of (NH_4)

All such plants immediately ceased to grow and appeared to find their medium thoroughly toxic, but when calcium sulphate was added in the proportion of 500 mg. per litre, the toxic effect was completely neutralized ; nor did it appear when the seedlings were transferred to a solution of calcium sulphate alone.

The following figures were obtained in two sets of experiments :

	Dry weight in mg.		
	Root	Shoot	Total
I. *			
Redistilled water	10.5	18.5	29.
$CaSO_4$	16.6	47.6	64.2
$MgSO_4$			17.6
H_2KPO_4	8.1	10.5	18.6
K_2SO_4	7.3	16.3	23.6
$MgSO_4 + CaSO_4$	17.0	45.3	62.3
$H_2KPO_4 + CaSO_4$	12.8	45.5	58.3
$K_2SO_4 + CaSO_4$	14.7	42.8	57.5
II. **			
Redistilled water	11	16.2	27.2
$CaSO_4$	18	38.7	56.7
NH_4NO_3			13.5
$(NH_4)_2SO_4$			13.7
$NH_4NO_3 + CaSO_4$	20	39.6	59.6
$(NH_4)_2SO_4 + CaSO_4$	19	36	55

* Mean weight of 6 seedlings.
** » » » 8 »

The experiments lasted 12 days and the temperature varied from 20° to 25° C.

The growth was practically the same whether the calcium sulphate was supplemented by other salts or not, and it would seem, therefore, that salts of potassium, magnesium, and ammonium do not play an important part in the nutrition of the pea seedling during its early development.

The antitoxic effect of calcium with regard to copper was also shown by growing a set of plants in ordinary copper still water, when the following results were obtained :

	Length in mm.		
	Root	Shoot	Total
Redistilled water	64	43	107
Copper still »	19	36	55
» » » + $CaSO_4$	36	83	119

The experiments were repeated with white lupins, which proved even more sensitive than the peas to the toxic action of the nutritive salts ; but, on the other hand, wheat and maize gave far less decided results, and with them potassium salts in the concentrations mentioned above hardly appeared noxious at all. The investigations are being continued.

655 - **Modifications and Mutations of Tuberous Plants.** — LABERGERIE in *Bulletin des Séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No. 2, pp. 157-161. Paris, 1913.

The writer mentions his previous investigations and those of Eckel and Verne on the mutations which have been observed to occur in *Solanum Commersoni*. These investigations were made in Poitou in 1912 and under unfavourable conditions from the point of view of insolation.

Nevertheless, the following points are worthy of notice : 300 plants were grown in different nutritive media, ranging from pure sand to arable soil, with the addition of 5, 10 and 25 per cent. in weight of a fertilizer consisting of the following substances :

	Per cent.
Well-rotted dung	25
Rabbit dung	12.5
Chicken guano	12.5
Horse dung	10
Leaf-mould and well-rotted dung	20
Grape pomace and lime	20

The tubers which showed a tendency to mutation in preceding years, when put into pure sand evinced clear signs of retrogession to the wild species, with abundant and prominent lenticels and rough skin ; the flowers reassumed their very long styles, their deeply divided corolla, and blunt sepals. While on the other hand forms in contact with *S. tuberosum*, such as Early Rose, Merveille d'Amerique and Violet Commersoni 1-01, maintained their modifications, which were much accentuated by the application of the above-mentioned fertilizer.

Another series of experiments was carried out with wild *S. Commersonii* collected in 1911 and compared with similar tubers gathered in 1910, which had been kept dry. The fertilizer had no effect upon the former, beyond causing a variation in the yield ; but the tubers of 1910, which had got very dried up, presented the following characters :

Pure sand: wild type maintained.
With 5 % fertilizer: wild type maintained with slight modification.
» 10 % » : four round regular tubers, almost without lenticels, modified.
» 25 % » : four round tubers, one almost without lenticels, much modified.

The writer considers that, given a season of full sunshire, the modifications would give rise, as in 1901, 1904, 1906 and 1907 to complete mutations. In any case, the results leave no doubt as to the great effect of vicinity increased by the application of manure.

A third set of experiments showed that 1.1 per thousand of manganese sulphate causes the medium to be infertile and entirely suppresses the development of tubers; with 5 per cent. fertilizer and 0.55 per thousand of managanese sulphate, the tubers were very irregular and few in number; with 25 per cent. of manure, the same amount of manganese allowed a more abundant development of tubers, but these were very irregular if the plants producing them were derived from much modified tubers.

The facts may be summarized as follows:

1) Plants in contact preserve their clear tendency to mutation, and fertilizers increase this action to the point of making the crops resemble in a marked degree the ordinary *S. tuberosum.*

2) Any drastic treatment of the tubers, such as prolonged desiccation, facilitates the action of the fertilizer, which, however, has not so much effect as when it is used in conjunction with contact action.

3) Large amounts of manganese paralyse the property of tuber production, while the effect of a small dose is yet to be determined.

656 – **Influence of Radio-activity on Germination.** — Petit, G. and Ancelin, R.: in *Comptes Rendus de l'Académie des Sciences,* Vol. 156, No. 11, pp. 903-905. Paris, March 17, 1913.

Seeds of rye grass, wheat and maize were germinated between sheets of damp blotting paper. In one set the water used for damping had a radio-activity of 0.089 mg.-min. per litre, while in a set of controls ordinary water was employed. In each case the radio-active water had a remarkably stimulating effect on the grains, though this effect did not become apparent till about the twelfth day after the commencement of the experiment.

PLANT BREEDING

657 – **On Cleistogamy in Rice *(Oryza sativa)* and the Possibility of Cross Fertilization.** — Farneti, Rodolfo in *Atti dell'Istituto Botanico dell'Università di Pavia,* Series II, Vol. XII, pp. 351-362, plate XIV. Milan, 1913.

The writer has been able to observe that the pales of rice never open, before, during or after the dehiscence of the anthers. Consequently the natural production of hybrids is impossible, even as a chance occurrence. All the varieties and forms in cultivation must have sprung from mutations. The great number of these may be explained by the marked diversity in the conditions of surroundings, climate and cultivation to which rice is subjected.

Rice is therefore a cleistogamous plant, but is exceptional among such in possessing flowers of only one type, with perfectly formed gynoecium and androecium. It is cleistogamous in that no natural internal pressure can open the flowers, as this is mechanically prevented by a hinging of the edges of the two pales throughout their length. This is perhaps a unique type of cleistogamy and presents much interest; it should be noted that

Leersia oryzoides, which is one of the few other cleistogamous grasses, and is a marsh plant closely related to rice, presents two types of flowers as is usual in cases of cleistogamy.

It is well known that climate and special conditions tend to modify the mechanism of pollination; it was therefore interesting to find out whether cleistogamy occurs in all varieties of rice and in all places where it is grown, or whether exceptions occur as in other cleistogamous plants, not excepting the species of *Leersia*. An examination was therefore made of 23 varieties of rice grown in Japan, sent direct from Nisigura, and of several varieties indigenous in Italy or introduced at various dates from abroad: not a single exception was found.

The cause of the cleistogamy of rice is presumably hereditary. *Oryza sativa* is a native of river banks and flooded land in Indo-China; in this country during its period of growth torrential rains occur daily, accompanied by flooding of the rivers. If the rice flowers opened, their fertilization would certainly be interfered with, if not prevented.

As natural hybridization is excluded, the writer attempted to find out whether there was any possibility of making artificial cross-fertilization. The practical results obtained by crossing in many cultivated plants, and especially in cereals, are such as to encourage any attempt at hybridizing rice, either by cross-fertilization or grafting. The production of hybrids by the latter means is, however, much disputed. With rice it was attempted as long ago as the beginning of the 18th century by Gianverardo Zeviani of Verona; he was the first to attempt grafting on rice, and indeed on any gramineous plant, with the idea of reinvigorating the species, which he believed to be degenerate. But the grafted plant did not give good results.

In the writer's experiments on hybridizing by artificial cross pollination, all the flowers artificially opened, whether or not the stamens were destroyed, remained unfertilized, while all those not operated on set seed.

He believes the failure was due not to lack of skill, or to the damaging of the flowers, but to other causes which remain to be investigated. He suggests a lack of sufficient moisture of the air within the opened flowers, as evaporation within the naturally closed ones would obviously be very limited. The experiments are to be repeated, and the plants dealt with will immediately be placed in a damp atmosphere, either under bell-jars or in forcing houses.

If the sterility of the flowers artificially opened but not mutilated was due solely to this cause, artificial crossing of rice, though very difficult, cannot be considered impossible. All will depend on the skill and patience of the operator.

658 – **Particulate Inheritance.** — BLARINGHEM, L. Sur l'hérédité en Mosaïque. — *IV Conférence Internationale de Génétique, Paris*, 1911, pp. 101-131. Paris, 1913.

In his works published in 1862-63, Charles Naudin pointed out that the characters of two parent species are not always uniformly distributed in all parts of their hybrid offspring, but that sometimes visible patches of the one parent occur side by side with visible patches of the other parent, the patches being apparently perfectly pure and free from all mixture, forming a kind of living mosaic. This conception extended to the germ cells supposed that the specific essences never really fused together to form a homogenous whole, but that they remained distinct and were for ever struggling to break away from one another. The tendency of the specific elements of each type to accumulate in visible patches is increased by cuttings and becomes more accentuated as the plant gets older, being especially developed at the time of the formation of the ovules and pollen grains. At such a time, if the separation is complete, returns to the parent species might be obtained amongst the offspring of hybrids. This hypothesis would account for the first hybrid generation being generally uniform, as contrasted with the diversity of types in the second generation, and for the facts of heredity in general, including Mendelian inheritance as a particular case.

Naudin was led to enunciate his principles from a consideration of the results obtained with the hybrids *Datura Stramonio-laevis*, *Linaria purpureo-vulgaris*, *Mirabilis longifloro-Jalapa*, and the writer adds his observations on these plants, and more especially a detailed account of his work on the barleys (*Hordeum distichum nutans* × *H. distichum erectum; H. distichum* × *H. tetrastichum ; H. distichum nutans* × *H. distichu nudum*) and *Pyrus Bellveriana* (sterile hybrid between *Pyrus* and *Sorbus*), which is all confirmatory. He shows, moreover, that the so-called sexual hybrids *Cytisus Adami*, *Crataegomespilus Dardari* and *Assieresii*, the Orange trees *Bizarria*, the almond-peach tree, etc., whose origin is uncertain, could be explained on the same hypothesis, and lastly that the vegetable chimeras of Winkler (1), Daniel's graft hybrids, and Baur's *Pelargonium zonale* all fall into line.

The writer contributes a considerable number of fresh observations on *Cytisus Adami*, and suggests that the name of *Naudinian heredity* should be adopted for this old hypothesis which he has revived.

659 — **The Bearing of Teratological Development in Nicotiana on Theories of Heredity.** — WHITE, O. E. in *The American Naturalist*, Vol. XLVII, No. 556, pp. 206-228. Lancaster, Pa., April 1913.

Two strains of *Nicotiana Tabacum* were investigated, the one being a fasciated sport of the other. When crossed there resulted in F2 a simple Mendelian ratio of 3 : 1 as regards normal and abnormal characters, and with a little practice the heterozygotes were distinguishable. The segregates bred true in the F3 and F4 generations.

The cytological examination of the plants showed that the abnormality is exhibited even in the germ cells, and the data as a whole raise a question as to the significance of chromosomes in inheritance.

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(1) See No 484, *B*. May 1913. (*Ed*).

660 - **Breeding of Vines.** — DERN: In *Mitteilungen des deutchen Weinbauvereins*, No. 12, 1912: summarized by DETZEL: in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 5, pp. 181-182. Stuttgart, March 1, 1913.

The writer advises the breeding of vines, not only for the purpose of increasing their productivity but also with a view to making them more resistant to diseases.

At the instigation of the writer, the Bavarian Government has established an Organization for vine breeding; a special official has been appointed for the work. The Society for the Promotion of Plant Breeding in Germany has also made a special section for vine breeding.

CEREAL AND PULSE CROPS

661 - **The Influence of the Environment on the Milling and Baking Qualities of Wheat in India: No. 2.** — HOWARD, A., LEAKE, H. M., and HOWARD, G. L. C. — *Memoirs of the Department of Agriculture in India*, Vol. V, No. 2. pp. 49-102. Calcutta, January 1913.

An account of the experiments of 1909-10 and 1910-11, a summary of which has already been published in the Annual Report of the Agricultural Research Institute of Pusa (1).

662 - **Soy Beans in India.** — WOODHOUSE, E. J. and SOMERS TAYLOR, C. The Varieties of Soy Beans found in Bengal, Bihar and Orissa, and their Commercial Possibilities. — *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. V, No. 8, pp. 103-175. Calcutta, March 1913.

At the present time soy beans are cultivated to a small extent in the Darjeeling Hills, and to no appreciable extent elsewhere in India, but during the years 1909-11 experiments were carried out in Bengal, Bihar and Orissa to ascertain the commercial possibilities of the crop in the plains.

Three definite types of beans have been isolated from native seed and studied. In two cases the oil content was found to be relatively high and the nitrogen content low, while in the other case the reverse occurred; these characteristics were inherited.

The yields obtained usually varied from 650 lbs. to 1 000 lbs. per acre, though under favourable circumstances they rose to 2 200 lbs. per acre; these yields compare favourably with those obtained in Manchuria. The cost of cultivation was estimated at 13*s* to 20*s* per acre, though it might rise to 27*s* per acre. Under these conditions, prices of £ 5 8*s* to £ 5 17*s* per ton are required to make the crop remunerative; for the present such prices are not to be obtained, £ 4 10*s* being offered by merchants in Calcutta. But there can be no doubt that the crop is intrinsically worth more than this, and signs are not wanting that its value as a food stuff is being appreciated, so that a considerable rise in prices is not unlikely.

The varieties used in the experiments occupied the land for two seasons in the plains and the crop had therefore to pay double rent. Efforts will now be concentrated on the production of new varieties combining the qualities of early maturity, productiveness, and high oil content, and if these attempts are successful, the projects of making the crop a remunerative one in India will be far more hopeful.

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(1) No. 357, *B*. April 1913, gives an abstract of this article. (*Ed.*)

ROOT CROPS

663 - **The Sweet Potato and its Cultivation.** — MATTEI, G. E. in *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo*, Vol. XI, Part 1-2-3, pp. 3-17. Palermo, January—September, 1912.

After giving some information respecting the origin and history of the sweet potato and a description of its biological characters, the writer deals with the cultivation and utilization of this tuber. He calls to mind the uncertainty which still exists as to the origin of this species, which has so far never been found wild in any part of the globe and has therefore been attributed by several botanists to different genera.

Choisy called it *Batatas edulis*, thus changing the name of *Convolvulus Batatas* given to the plant by Linnaeus and creating a new genus; now, the sweet potato is identified under the name of *Ipomoea Batatas* Poiret; it was considered by Asa Gray to be the cultivated form of *I. fastigiata*.

It has a number of popular names in America: "Ajes" in the West Indies, "Camotes" in Mexico, "Jatica" in Brazil, "Apichu" and "Skinet" in Peru. In Asia and Africa, the natives use names which cannot always be attributed with certainty to this plant alone; the most certain are "Dankali", "Kitaiti" and "Veezee", which are current in Central Africa.

The sweet potato requires an equable, sub-tropical climate; nevertheless it grows at high altitudes in temperate and nearly cold regions, such as Venetia in Italy, where it is extensively cultivated. The soil must be very thoroughly worked, but not too deep; it requires liberal supplies of potash, and green manures, farmyard manure, cotton cake, etc., should be given. It is multiplied by slips or "draws", the latter being the safer method. In both cases, the soil should be made into ridges 2 feet apart; on these the plants are placed in one line, at intervals of 1 foot.

In hot climates, the tubers attain their complete development three months after planting, while in Italy, even if they are placed in the ground at the most favourable date, the beginning of April, the crop cannot be dug until October. Under ordinary conditions and in temperate countries, the average yield is about 1 lb. per plant and 7 or 8 tons per acre.

The sweet potato is especially grown as an article of food and is much appreciated in hot countries; in Brazil, it is used for the preparation of an alcoholic beverage. The tubers contain from 15 to 30 per cent. of starch, which is easily extracted; this has lately been put on the market under the name of "Brazil Arrowroot". They also have 12 per cent. of sugar, but the latter is difficult to isolate owing to the presence of glucose. The very young stalks are eaten as a vegetable, the harder, stringy ones making good forage. The sweet potato is employed in the preparation of syrups, and its content of sugar only extracted with difficulty, together with its richness in starch, make it an excellent raw material for the alcohol industry.

FORAGE CROPS. MEADOWS AND PASTURES

664 – **Pasture Problems: Drought Resistance.** — STAPLEDON, R. G. (Agricultural Department, University College of Wales, Aberystwith) in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 129-151. Cambridge, March 1913.

The effect of the drought of 1911 on some pastures in the Cotswold district was studied by making quantitative and qualitative analyses of the herbage at various periods of the year, and observing the behaviour and power of resistance of a large number of its constituent species.

665 – **Teff *(Eragrostis abyssinica).*** (1) — BURTT-DAVY, J.: in *The Agricultural Journal of the Union of South Africa*, Vol. V, No. 1, pp. 27-37. Pretoria, January 1913.

The writer, who introduced the cultivation of teff as a forage grass into the Transvaal in 1903, gives an account of its history in that country, and shows how slowly the crop came into favour in spite of favourable reports on trials made in Natal as far back as 1887. It has now proved itself a complete success and is fast becoming a staple hay crop throughout civilized Africa, its qualities being: palatability, high nutritive value, heavy yield, rapid growth, drought resistance, and ability to smother weeds. The experience of the Transvaal might well be repeated in India and Australia where preliminary trials proved satisfactory, but where the subsequent popularization has not yet occurred.

FIBRE CROPS

666 – **Russian Cotton.** — TARIS, E. in *L'Agriculture Pratique des Pays Chauds*, Year 13, No. 119, pp. 89-111. Paris, February 1913.

During the months of April to September 1912, a Commission was sent from the French Colonial Office to travel through Turkestan and Transcaucasia in order to make an enquiry into the general conditions of agriculture of those countries, more especially with regard to the cultivation of cotton, and the developments that are likely to take place in the production of that article. Starting from Poti and Batum on the Black Sea, the Commission travelled east through the entire tract of country as far as Kokand and the Ferghana Province, gathering information directly from agriculturists, and statistics from the Director of the Domain at Tashkent, the Committee of the Stock Exchange at Kokand, agricultural engineers in Turkestan, and the Director of Water Inspection in Transcaucasia.

I. *Turkestan* consists of two distinct regions: the one, in the North, an immense plain, arid and desert with the Ural Sea as a central depression; the other, in the South, mountainous and more fertile. The latter is traversed by two principal rivers, the Syr-Daria and the Amu-Daria, which are over 2 000 versts (1326 miles) long and on which the prosperity of the country chiefly depends; the province of Semiryechensk (just South of the Lake of Balkash) is the only well watered district in the country. The climate is typically continental, *i. e.* subject to great extremes, and the average rainfall varies from 5.2 in. to 12.6 in., rising to 22.8 in. in the Province of Semiryechensk.

The soil consists of a very thick layer of loess clay, which forms a fine yellow-white dust during the summer and dries with a very hard crust when wetted, occasionally making germination very difficult. Needless to say, cultivation is only possible where irrigation is practised, and as the water supply is limited, the area under crops only represents 1.8 per cent. of the total area of the country and is restricted to the river valleys. However, with better management of the water supplies it would doubtless be possible to extend the cultivated area very largely, and were this accomplished, the annual rainfall might also increase gradually, for old traditions of the tenth century indicate that much of the country which is now a desert was at one time productive.

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(1) See also No. 2107, *B*, July 1911. (*Ed.*).

The crop distribution in 1909 was as follows :

	Acres	Per cent. of cultivated area
Wheat	3 891 225	47.5
Rye	80 589	1.0
Barley	761 270	9.4
Oats	379 138	4.6
Millet	526 275	6.4
Maize	392 966	4.8
Cotton	798 026	9.7
Rice	457 748	5.6
Peas	45 433	0.6
Linseed	134 084	1.6
Lucerne	621 599	7.6
Others	101 526	1.2

The area in cotton is small and unequally distributed amongst the provinces, Ferghana producing 111 080 tons out of a total of 176 600 tons. The cotton is ginned in Turkestan, where numerous factories exist, not only for ginning purposes, but also for dealing with the seed and its products. The lint is all exported to Russia, where it is woven into cloth and then reexported for the most part to the Turkestan markets. It is hoped, however, that this uneconomical state of affairs will not persist much longer and that cotton mills will shortly be established in Turkestan itself.

Difficulties of transport are immense in Turkestan and are a serious charge on the exported cotton. There exist two railway lines : one, the Orenburg-Tashkent which comes from the north, touches the Ural Sea, and then follows the Syr-Daria to Tashkent, and the other starting at Krasnovodsk on the Caspian Sea and running west to Andidjan (Ferghana). Freights to Moscow vary from £ 6 5*s* to £ 7 8*s* per ton, and to this must be added the cost of conveying the goods from the market to the railway line, which may amount to £ 6 16*s* per ton. High freights impede the development of cotton cultivation in yet another way, for they constrain every district to produce its own corn before turning its attention to other crops, and consequently those parts which are specially adapted to the growth of cotton cannot devote as large an area to it as they otherwise would.

The economic situation of the native cultivators too, is unsatisfactory, for they possess little knowledge of the cotton crop and insufficient capital ; many who have embarked on its cultivation have fallen into the hands of usurers, getting more and more into debt every year. But, should steps be taken : 1) to relieve this situation by the organization of credit societies, 2) to improve transport, and 3) to create experimental stations for the guidance of the native cultivators, the profitable cultivation of cotton is capable of immense development, and having satisfied the demands of the Russian market, a large surplus of medium quality American Upland cotton could be put on the other European markets.

II. *Transcaucasia* is a far richer country than Turkestan, more densely populated, and more varied in every way. It is essentially mountainous, and besides mineral riches possesses a fertile soil, a good climate, and a sufficient rainfall. Vines, fruits, tobacco, tea, maize, cereals are all cultivated. The districts suitable to cotton are in the south-east, in the valleys of the Aras and the Kur, where the rainfall is smaller and irrigation can be practised. Cotton is a far less important crop in this country than in Turkestan. It has only been introduced about 10 years and plantations are not numerous, being still in the experimental stage. But it is safe to predict that Transcaucasia would easily produce as much cotton as is being produced in the whole of Turkestan to-day, and moreover its geographical position is far more favourable for reaching the European markets. For the present, however, no considerable output from that quarter is to be expected.

667 – **The Cotton Industry of Northern Nigeria.** — *Bulletin of the Imperial Institute* Vol. XI, No. 1, pp. 70-79. London. January-March 1913.

" Cotton has long been cultivated by the natives of Northern Nigeria, and the markets of the more northern parts have been frequently visited by caravans from North Africa in order to obtain the cotton used in the weaving industry of that part of the continent. Hitherto transport difficulties have prevented the cotton of the northern districts being exported to the United Kingdom, but the completion of the Baro-Kano railway will enable this vast and populous area to be tapped. Up to the present the efforts to encourage cotton cultivation amongst the natives have been confined to the Niger and Benue valleys, and with this end in view the British Cotton Growing Association erected ginneries at Lokoja, at the junction of the Benue and Niger rivers, and at Ogudu on the Niger in the Ilorin province. More recently a large ginnery has been erected at Zaria, further north. The Ogudu ginnery, however, was closed on the opening of the Lagos Government Railway, the cotton from this district being ginned in Southern Nigeria. "

" In the Kans and other northern districts, the indigenous cotton is short stapled with white lint, whilst that of the Benue and Niger valleys is long stapled with tinted lint. Plantations have been formed by the British Cotton Growing Association at Lokoja and Ogudu, where experimental work has been carried out on the acclimatisation of exotic seed, selection of native seed and varieties, rotation of crops, time of planting, comparative tests of varieties, cultivation by draught animals, etc. Exotic cottons have also been experimentally cultivated at some of the gaol farms. "

"Complete statistics of the exports of cotton from Northern Nigeria are not available, but some idea of the production may be gained from the following figures, showing the quantity of unginned cotton purchased by the British Cotton Growing Association and by merchants in recent years:"

1904	150	1908	152
1905 1906	362	1909	375
		1910	111
1907	368	1911	230

A collected report is given of the samples received for examination since 1909. Out of a total of 14 samples, 12 indigenous varieties and one improved American Upland were valued as approximately equal to the current price of "middling" American, while a second improved American Upland variety was valued at 9*d* per lb. with "middling" American at 6.60 *d* per lb.

668 - **Cotton in Egypt and the Anglo-Egyptian Sudan.** — Schanz, Moritz in *Beihefte zum Tropenpflanzer*, Vol. 14, No. 1-2, pp. VII + 180. Berlin, February 1913.

In the above double number of the supplement to *Der Tropenpflanzer*, the writer gives a brief historical review of cotton cultivation in Egypt; he then deals with the natural and economic conditions of 1) Egyptian and Sudanese agriculture in general (soil, climate, irrigation, tillage, schools and associations, forms of tenure, credit systems); 2) the cultivation of cotton in both countries (especially: varieties of cotton, seed cotton and seed breeding, cotton growing, pests of the crop, profits, uses, and export and import of cotton).

SUGAR CROPS

669 - **The Distance apart for Sugar Beets. Experiments in Hungary.** — Jancsó, Béla in *Mezögazdasági Szemle*, Year XXXI, Part 4, pp. 192-194. Budapest, April 1913.

The high cost and bad conditions of labour in Hungary oblige farmers to have frequent recourse to the use of agricultural machines. In sugar-beet growing, horse-hoes are much employed and are very useful, not only because they do the work more cheaply than hand labour, but also because there is frequently a deficiency in labourers. It is obvious that the greater the distance between the rows, the more successfully horse-hoes work, even when in the charge of unskilled labourers. Hungarian farmers are beginning to find that the usual space of 14 3/4 ins. between the rows is not sufficient, and already some of them are trying to exceed it. The present question under discussion is whether, and how far, this limit can be safely exceeded in Hungary, without decreasing the quantity or quality of the crops.

In order to solve the problem, the Royal Hungarian Agricultural Station has made experiments on 13 estates according to the following plan:

TABLE I.

Plots	Distances between the rows. in.	 between the plants in.
1 and 5	14 3/4	8 1/4
2 » 6	16 3/4	8 1/4
3 » 7	17 3/4	8 1/4
4 » 8	25	8 1/4
9 » 13	14 3/4	12 3/4
10 » 14	16 3/4	12 3/4
11 » 15	18 3/4	12 3/4
12 » 16	25	12 3/4

As is seen, the tests served for the comparison of four different distances between the rows and two between the plants. The minimum distances were taken as 14 3/4 by 8 1/4 in, these being the usual distances in Hungary.

TABLE II.

Names of estates	Experiment Plots 120 sq. in 14 3/4 × 8 1/4	 137 sq. in. 16 3/4 × 8 1/4	 153 sq. in. 18 3/4 × 8 1/4	 184 sq. in. 14 3/4 × 12 3/4	 208 sq. in. 16 3/4 × 12 3/4	 205 sq. in. 25 × 8 1/4	 233 sq. in. 18 3/4 × 12 3/4	 213 sq. in. 25 × 12 3/4
Peresszteg	1	1	1	4	6	5	3	10
Szerencs	1	1	1	7	8	1	8	7
Botfalu.	1	3	6	4	5	—	10	—
Nagytelek	1	1	3	3	5	8	10	10
Diószeg	3	4	4	1	1	6	1	4
Galánta	2	1	2	1	1	5	5	4
Gány	2	1	1	1	2	3	2	4
Elecske.	3	1	5	6	8	5	10	6
Páld	3	1	1	1	1	3	4	3
Réte	1	1	1	1	2	3	4	5
Ispácza.	2	2	3	1	3	4	3	7
Ujhely	1	1	2	1	1	3	1	3
Kosut	3	1	2	1	1	1	3	2
Average . . .	1.84 2	1.46 1	2.46 3	2.46 3	3.38 4	3.61 6	4.92 7	5.00 8

Table II gives the average results of the experiment plots. The latter were numbered in the following manner: differences in the crop of less than 5 per cent. were not taken into consideration, but were noted down. Crops 5 per cent. below the maximum were numbered 1; those from 5 to 10 per cent. below, 2; those 10 to 15 per cent. below, 3, and so on.

The columns are arranged according to the increasing distances.

According to this table, the maximum crop was obtained with a distance of 16 3/4 × 8 1/4 in., while larger distances gave considerably lower crops. It is interesting to note that, with the same space between the rows, the yield was inversely proportionate to the distance between the plants in the rows. A distance between the rows of 25 in. caused a reduction in the crop, even when there was no drought. A slight increase in the distance had no bad effect on the sugar-beets, but if the space was further increased, the quality of the beets suffered in proportion. Finally, the experiment proved that with the distance of 16 3/4 × 8 1/4 in. a better crop can be obtained than with that of 14 3/4 × 8 1/4 in. which is usual at present in Hungary. Nevertheless, the writer is of opinion that the question of distance depends upon climatic conditions and upon the quality of the soil. Thus, in a district with more frequent rainfall and where the soil is richer in humus, the space of 16 3/4 in. between the rows is too much, and beets grown under these conditions do not thrive so well.

He advises every farmer to make experiments to decide the best distance to be adopted in his special case.

670 – **The Use of Commercial Salt as a Fertilizer for Sugar Beets in Hungary.** — JANCSÓ, BELA in *Köztelek*, Year 23, No. 23, pp. 808-809. Budapest, March 22, 1913.

The wild form of the cultivated beet is *Beta maritima*, which is found growing in saline soil and in a salt-laden atmosphere on the coasts of Europe. This fact led experimenters to try whether mangolds and sugar beets took kindly to the application of kitchen salt as a manure. In order to test the effect of this fertilizer, the Royal Agricultural Station at Magyaróvár began a series of experiments in 1909, using however commercial salt instead of the kitchen article, as being less expensive. The experiments of 1909 and also those of 1911 showed that, under certain conditions, the beet reacts satisfactorily to the application of this substance, but that if the soil is too heavy, the salt easily gives rise to cracks, which hinder the development of the plant.

By order of the Ministry of Agriculture, these experiments were continued last year on the State Domains and at the Agricultural Schools. The writer summarizes the results of 23 experiments arranged in four groups:

I. Experiments on sugar beets on eight estates with heavy clay soil using 315 lbs. of commercial salt per acre. In four cases the salt increased the crop, in three it had no effect upon it, while in one the result of the application of the fertilizer was to reduce the yield.

II. Experiments at seven different places using 235 lbs. of commercial salt per acre. Here also the crops were increased in four cases. On the Mácsa State Stud farm at Gödöllö, on the contrary, the yield of the control plot exceeded that of the salted plot by 600 lbs.; but owing to the drought prevailing during August and September, the heavy clay soil of this estate only yielded a very poor crop.

III. Four experiments using 160 lbs. of salt per acre; of these two gave good results; in the case of the others, which were on loose sandy soil, the salt had no effect.

IV. Experiments with different amounts of salt. The results obtained show that, in order to increase the beet crop, at least 160 lbs. of salt per acre must be applied; if the amount is raised to 320 lbs. its action is more efficacious. On the Fogaras State Stud farm the fertilizer was applied in the rows. This experiment showed that 160 lbs. of commercial salt applied in this manner have a more noticeable effect than 320 lbs. broadcasted.

All these experiments therefore show that this inexpensive compound can, under certain conditions, increase the sugar beet crops, but it must be used with caution where the soil is heavy.

671 – **The Date Sugar Industry in Bengal.** — ANNETT, H. E. in *Memoirs of the Department of Agriculture in India*, Vol. II, No. 6, pp. 282-389. Calcutta, March 1913.

Out of a total of 3 000 000 tons of raw sugar or 'gur' produced annually in India, at least one-tenth, or 300 000 tons, and probably more, is produced from palms, so that the industry is still a considerable one, though it seems to have declined somewhat of late years in favour of imported products from Java. Bengal accounts for about a quarter of the total produce, and the writer made an extensive study of the agriculture of the date palm (*Phoenix sylvestris*) in the Jessore District, including methods of cultivation and tapping, and of the manufacture of raw and refined sugars.

The yield per tree varied considerably both with individuals and with plantations, but 170 lbs. of juice may be taken as an average yield per tree throughout the date sugar districts; this estimate is considerably lower than any which have been made previously. On boiling down, 170 lbs. of juice forms 21 ¼ lbs. of gur, and with 240 trees to the acre, 2.3 tons of gur may be obtained per acre, a higher yield than can be obtained from cane in the same districts.

The raw juice contains 8 to 14 per cent. of sucrose, associated with practically no glucose; but, owing to imperfect methods of collection, 1 to 2 per cent. of glucose is formed during the process. The boiling is carried out in small earthenware pots, and results in a loss which may amount to 20 per cent. of the sucrose, while the refining processes cause further wastage. Each cultivator possesses his own primitive boiling plant, and the gur is the staple marketable commodity. Large quantities are consumed locally, and the surplus is sold to middlemen who either transport it to more distant parts for direct consumption, or sell it to native refineries. Calcutta is the chief market, and large quantities are there made into sweatmeats. The refined sugars are mainly consumed by the richer classes of natives, and the molasses are used for making rum and for mixing with tobacco.

Simple and inexpensive reforms are suggested by the writer, more especially with regard to the tapping, but also in the boiling and refining processes. These should effect great improvements. Judging from the success obtained by improved methods employed in the Maple Sugar Industry in America, where a juice containing only 3 per cent. of sucrose is exploited, a little expenditure of capital in the date sugar industry in India would yield ample returns.

OIL CROPS

672 - **The Recent Evolution of the Exploitation and the Industry connected with the Oil Palm.** — BRET, M. C. in *Journal d'Agriculture Tropicale*, Year 13, No. 140, pp. 42-47. Paris, February 28, 1913.

The exploitation of the oil palm has, under European guidance, evolved from a home industry into an important commercial undertaking. The origin of this movement is to be sought in the reputation enjoyed by certain districts for possessing oil palms (*Elaeis*) which might be from 10 to 30 times more reproductive than they actually are at present.

The native palm groves receive no care, and the method of their exploitation leaves much to be desired; often the stands spring up after forest lands have been cleared, and their ownership is doubtful; sometimes the groves remain unexploited on account of the small number of the inhabitants. In order to prevent this loss, the Governor of the Ivory Coast first tried to induce immigration into the thinly populated rich districts from those which were poor and densely populated, but the practical difficultes entailed prevented the scheme being extended to other districts. It has been attempted with some measure of success to render the exploitation more intense by distributing among the natives little machines for crushing the nuts and thereby extracting more oil. The conditions obtaining prove the possibility of European industrial exploitation, but this could only exist in stands which are sufficiently extensive and rich to provide work for a factory, so that districts must be selected in which the biological conditions are the most favourable.

An attempt has been made to co-operate with the native workers by obtaining the sole right in certain zones of treating the fruit mechanically, thus forcing the former to sell their produce to the factories. This method, which is at variance with the usages of the natives, has not proved wholly successful. Installations based on this arrangement exist in the Kamerun and in Southern Nigeria; they are instituted by special legislation on the Ivory Coast and the Gold Coast.

The purchase from the natives of land bearing palm trees is a matter of great difficulty owing to the possession in common and various legal and administrative hindrances. Fairly remunerative contracts have been drawn up on the Ivory Coast by which the right of gathering the nuts has been ceded for a certain period of time.

Success can only be obtained by companies possessing capital sufficient to tide over the difficulties which are inevitable at first. According to the writer, success lies in the direction of systematic planting and the subsequent establishment of factories.

RUBBER, GUM AND RE
PLANTS

673 - **The Cultivation of Rubber Trees in West Africa.** — CHEVALIER, AUGUSTE in *Journal d'Agriculture Tropicale*, Year 13, No. 140, pp. 33-37. Paris, February 28, 1913.

The writer publishes some notes respecting the cultivation of different rubber-producing trees in West Africa and lays stress on the fact that the annual output of rubber in Tropical Africa has remained stationary for some years, so that it is high time that energitic measures were taken to make plantations.

After reviewing the results obtained in the different regions of West Africa with *Manihot Glaziovii* and giving the data collected regarding the yield from tapping, the distances between the trees, and the selection of seed, he recognizes the fact that the value of this tree for plantations in West Africa has not yet been determined. He suggests that all the trials should be made again, using seed from improved trees grown in German East Africa, since this colony possesses trees whose yield is well above the average and which can be tapped from two-and-a-half years, yielding throughout most of the year.

674 - **Method of obtaining Tall-Growing Trees of *Manihot Glaziovii.*** — ZIMMERMANN, A. in *Der Pflanzer*, Year IX, No. 1, pp. 16-18. Daressalam, January 1913.

The writer has made a number of experiments, both at Amani and in other plantations, for the purpose of ascertaining the best methods of inducing height in such plants of *Manihot Glaziovii*, as, by reason of unfavourable climatic conditions or other undetermined causes, flower too early and thus ramify at an insufficient distance from the ground.

The following are the results of one of the experiments made at Amani:

The trees used had been planted in April 1911 and had mostly branched very low down. In September 1911, they were pruned in three different ways: 1) topped at 12 to 16 in. from the ground; 2) topped immediately below the lowest bifurcation; 3) at each point of ramification all the branches were removed, except the one nearest the stem; a month later the fresh shoots were treated in the same way. A fourth lot consisted of plants raised in the nursery and planted out in September 1911 in the place of dead trees, or such as were not growing well.

It was found that the trees of the third group, which had grown zigzag as a result of the pruning, never became straight, although they were young and the side shoots were constantly cut off. Further, the terminal shoots at once flowered again and gave rise to new ramifications. Thus, by this means no perceptible increase in the length of the stem is obtained. In the case of the trees of the second lot, new shoots at once made their appearance: these were all removed except the most vigorous, which grew in perfect line with the stem, in such a manner that the point of junction became less and less perceptible. These trees began to branch again much more rapidly than those of the first lot, of which the stems were the highest of these three groups (averaging respectively 5 ft. 6 in., 3 ft. and 4 ft.).

The results obtained with the fourth lot were slightly more satisfactory; under the influence of favourable climatic conditions, these produced very tall stems (5 ft. 8 in.). The average circumference at 3 ft. in the four lots was 8 ¼, 10, 10 and 7 ½ in. respectively.

In conclusion the method most to be recommended is the topping of the stem at 12 or 16 inches from the ground, which should be done as soon as the first branching begins.

VARIOUS CROPS

675 - **The Results of Szeged Tobacco Selection in Hungary.** — SZÉKÁCS, ELEMÉR in *Magyar Dohánynjsag*, Year XXX, Nos. 6 and 7, pp. 2-4 and 2-3. Budapest, March 20 and April 5, 1913.

It is more difficult to select tobacco by the pedigree system than it is to select cereals by the same method, for in the case of the latter, the seeds themselves are the commercial product and can be compared with the best varieties, while with tobacco it is the leaves which are the object of selection. As the leaves of the plants grown for seed production lose all their substance it is only possible to decide from the leaves of the second generation whether the parent plants had been well chosen and were suitable for reproduction. In order to shorten this long process, the writer at the time of the first selection experiment with Szeged tobacco in 1899, tried the following method: he removed all the flowers from the parent plants, except the top one which is the first to open. In this way, the plant does not exhaust itself in seed development but some of the sap is left for the use of the leaves, which retain their good quality and can be judged on the parent stem.

This experiment was successful: The parent plants ripened their single seed capsule completely; the leaves were gathered when mature, dried and sorted plant by plant, and valued before being made up into bundles. It was at once possible to observe among the leaves the greatest differences in form, size, colour, weight, texture, elasticity and conbustibility.

In 1910, when the estate of Arpadhalom was entrusted, under the direction of the writer, with the cultivation of Szeged tobacco for the district of Békéscsaba, the experiments were resumed. In addition to the unselected seed chosen by the Government, he took the 25 parent plants of which the leaves best showed the characteristic qualities of Szeged tobacco. After proceeding in the manner described above he sent the leaves of each stem, made up in different bundles, to the Royal Experiment Station of Tobacco Cultivation at Debreczen, where they were submitted to chemical analysis. After minute analysis, 5 of the 25 parent plants were pronounced suitable for propagation. In 1912, these 5 pedigree families produced sufficient seed to sow about 4 ½ acres, so that in 1913, all the growers of the Békéscsaba district were able to grow exclusively pedigree tobacco. Further, 5 "métayer" tenants on the estate planted on their land plants belonging to the same 5 pedigree families; each cultivated a separate family in the yield.

The writer gives a very detailed table showing the results obtained with pedigree and with unselected tobacco; the different columns give the areas sown, the yield of leaves and their classification, the average gross return and the returns per acre.

	Selected families	Unselected tobacco	Excess due to selection
Average yield per acre	1632 lbs.	1569 lbs	63 lbs.
Gross return per acre (sale price).	£16-13-0	£15-1-8	£1-11-4
Average sale price per lb. . . .	2.45*d*	2.31*d*	0.14*d*

M. Marton Liebhart, who is attached to the Station, established that the individual characters of each family were most striking, and that selected plants infallibly transmitted their physical characteristics. If, however, the crop was less than had been hoped, this was due partly to a bad autumn, and partly to the tenants, who were not of one mind with the cultivators, and their carelesseness and obstinacy had an unfortunate result on the crops. In order to encourage emulation and to induce the tenants to work more harmoniously with the cultivators, the writer suggests that annual prizes should be given by the Tobacco Departement to those tenants who obtain the best results. Nevertheless, those hitherto obtained are sufficient to show that a great impetus has been given to tobacco growing in Hungary, thanks to pedigree selection.

The writer proposes to continue the minute comparison of the five families already existing and to improve other selected types, in order to obtain other pedigree families.

676 – **Experiments on Growing Coffee under Shade.** — BERTONI, MOISÉS S. Experimentos sobre la Resistencia del Cafe á la Maleza y su Crecimiento á la sombra de Arboles. Primera Serie: de 1909 a 1912. — *Agronomia, Boletin de la Estación Agronomica de Puerto Bertoni*, Vol. V, No. 3-4, pp. 119-128. Puerto Bertoni, Paraguay, January and February 1913.

This bulletin gives a preliminary report on a series of experiments carried out from 1909 to 1912.

The writer, having observed that coffee plants grow very well in company with all wild plants, except Gramineae and Compositae, set himself the task of ascertaining whether, by taking advantage of this fact, it would be possible to save the expense entailed by hoeing. To this end, he planted one-year coffees among the trees of a thinned virgin forest. He made four plots, which were hoed 1 to 4 times respectively in the year, and in each of which there were plants with much, little, and hardly any, shade. The experiment showed that those plots succeeded best which were only hoed once or twice (provided there were not many grasses or composites present).

This was the case under the conditions prevailing in Paraguay, *i. e.* with an annual rainfall of from 1500 to 2500 mm. (60 to 100 in.) and 70 to 80 actinometric degrees as the absolute annual maximum.

The writer concludes that in Paraguay shade is indispensable to coffee plantations (though he allows that elsewhere a herbaceous intercalary crop giving no shade might be the best). The depth of the shade should depend on the number of hoeings, but the protection is most necessary even if the plot is only hoed once. Shade is requisite for coffee trees of all ages; it is doubtful whether Leguminosae always afford the best protection; the writer obtained the best results with species of *Guarea* (Meliaceae) about 10 ft. high and the worst with *Lippia virgata* (Verbenaceae), or "Niño-rupà", about 6 ft. 6 in in height.

677 – **Pepper Production and Trade in Siam.** — *Ministère des Colonies, Bulletin de l'Office Colonial,* Year 6, No. 63, pp. 77-79. Melun, March 1913.

Only two kinds of commercial pepper are recognized in Siam: — white and black. Nevertheless, of late years it has become the habit in some provinces to distinguish four qualities of black pepper; the first consists of only perfect seeds, round and full, and the fourth of small or broken seeds and fragments, the second and third being intermediate. The following table gives the average price of pepper at the place of production for the year 1911-1912.

	ticals per picul	pence per lb.
White pepper	56	7 3/4
Black pepper: 1st quality . . .	36	5
» » 2nd » . .	32	4 1/2
» » 3rd » . .	23	3 1/4
» » 4th » . .	13	1 3/4

The tax on transit in the interior is 1.25 tical per picul (about 1 3/4 *d* per 10 lbs.) in the case of white pepper, and 1 tical per picul (1 1/2 *d* per 10 lbs.) for black. In 1911-1912 (the Siamese year begins on the first of April) the total export of pepper from Siam was 34270 piculs (4 569 300 lbs), worth 1 193 297 ticals (£ 919 933). The port of Bangkok exported 24 200 piculs (3 226 700 lbs.), worth 921 174 ticals (£ 710 072), while Puket exported 10003 piculs (133 700 lbs.), worth 271 827 ticals (£ 209 544). The chief buyers of Siamese pepper are England (13093 piculs = 1 754 700 lbs. in 1911-1912) and the United States (2291 piculs = 305 460 lbs. in 1911-1912). During the same year, 4677 piculs (623 500 lbs.) were sent to Singapore and 2367 piculs (315 600 lbs) to Hong Kong.

MARKET GARDENING

678 – **Experiment Field for Strawberries at Rétfalu, Hungary.** — HEGEDÜS, ALADÁR in *Mezögazdasági Szemle,* Year XXXI, No. 4, pp. 186-188. Budapest, April 1913.

In the wooded mountainous country of the commune of Rétfalu (Sopron County), fruit growing has for many years been the principal source of revenue of the inhabitants. In the last 15 years, however, such an impetus has been given to strawberry growing that 250 to 300 tons of this fruit, worth over £10 000, are sent annually to the Vienna market. This remarkable result has caused the Ministry of Agriculture to take every possible measure to still further increase strawberry cultivation, especially by improving the quality and introducing varieties which can supply the market from the commencement of spring to the end of autumn. The Ministry decided to lay out an experiment field for the purpose of spreading practical knowledge respecting improved methods of cultivation and for the acclimatisation of different varieties of strawberries and the distribution of proved kinds to growers.

The preliminary operations began towards the end of 1911. On March 1, 1912, an area of nearly 3 acres was rented for ten years on the entailed estate of Prince Eszterhazy. From that date, the necessary work for the preparation and irrigation of the soil has been in progress. In order to ensure a sufficient water supply eight reservoirs have been made into which pipes take the water direct from the ducal domain. A shed has been built by the Ministry of Agriculture to serve as a depôt and also a packing and tool shed.

The experiment field is divided into three lots, each containing 800 beds of strawberries. In order to propagate intensive and systematic strawberry cultivation, a course of three half-years (middle of March to middle of October) has been arranged; the programme of instruction is as follows:

Year I: Preparation and working of the soil, and planting; gathering and packing the fruit.

Year II: In addition to the above work, the artificial multiplication and selection of varieties which suit the climate; the preparation and storing of seed.

Year III: Especially the control of strawberry pests and the testing of various remedies.

The experiment field has been in full working order for nearly a year. The writer intends to carefully follow the different stages of the undertaking and to make known the progress of the work, which is expected to prove most satisfactory.

679 - **Varieties of Water-Cress.** — LESOURD, F. in *Revue Horticole*, Year 85, No. 7, pp. 164-165. Paris, April 1. 1913.

In industrial water-cress beds which supply large towns, the wild species (*Radicula Nasturtium-aquaticum*) is not grown, as it is not sufficiently productive. From seed and by selection, stronger, more productive varieties have been obtained, differing from the wild type in the luxuriance of their foliage and the form of their leaflets. The four following varieties are the most remunerative: Billet cress (old variety), 7 leaflets; Boulanger, 5 leaflets; Chéron, 3 leaflets; Billet (new variety), 3 leaflets.

680 - **Capsicums.** — FOUSSAT, J. in *Revue Horticole*, Year 85, No. 7, pp. 164-165. Paris, April 1, 1913.

The writer deals with the cultivation of capsicums in France, which is effected either in frames, or else in the open in the South and in very sheltered spots.

In the North, the very hot-flavoured kinds are chiefly grown, e.g. the long, common, red capsicums used as condiments. In the South are grown the following varieties, which are much milder, and under various forms, both cooked and raw, form a part of the daily food of the people: Large

Mild Square, Spanish Mild Square, Early Yellow Square, and American Mild Square.

FRUIT-GROWING

681 – **The Summer Transplanting of Grafted Vines.** — LE JEAUX, JEAN in *La Vie à la Campagne*, Vol. XIII, No 157, pp. 210-212+fig. Paris, April 1, 1913.

The writer gives an account of a transplanting method adopted by a Russian, M. Tutrumov in the case of grafted vines in Bessarabia. The latter was of opinion that vines could well be transplanted in July or August of the same year in which they were grafted. The grafts would then begin to grow in their new position in the autumn and continue in the following spring. In order to carry out the summer transplanting, M. Tutrumov had a sheet-iron cylinder made 13 inches high and 9 inches wide; a strengthening ring was fixed at the top and a handle attached to the cylinder, as for a bucket; the cylinder is open at the bottom. This cylinder is driven into the soil round a vine, the soil being moistened and a narrow spade being used to help; when it is level with the surface, the enclosed soil and vine can be lifted by simply moving the cylinder from side to side a little and then drawing it out. These cylinders can be carried as they are if the soil is firm, but if it is loose a false bottom must be hooked on. For replanting, the cylinder is sunk in a hole and the soil pressed well round it: the earth inside is then watered and cut away from the walls with a knife, after which the cylinder can be drawn out.

M. Tutrumov finds this method always successful; the vines outstrip others of the same age, but not moved till the following spring, to such an extent that they might have been transplanted a full year earlier.

The writer remarks that, though this method may be too lengthy for planting on a large scale, it is well worth trying for gapping up; but the vines should be planted perfectly upright in the nurseries, as otherwise the roots would be cut off when the cylinder is forced into the ground.

682 – **The Koshû Vine.** — OINONE, J. in *Revue Horticole*, Year 85, No. 8, pp. 185-186. Paris, April 16, 1913.

Japan, on account of its excessively damp summers, is a very unsatisfactory country for vine cultivation; nevertheless some varieties of vine are grown there, one of which, called Koshû and belonging to the species *Vitis vinifera*, is much prized.

This vine is vigorous and has rather thick, fleshy roots which cannot resist phylloxera. There are two varieties: improved Koshû and Marunni Koshû (*i. e.* with round grapes). It resists chlorosis well, and is almost a climber as its stem is weak; the bark is thick. Buds simple or compound, very large, wide at the base, but not very pointed; young leaves rather thick, with five shallow lobes, hairless and smooth on both surfaces; veins green, and teeth very acute.

In Tokio, this vine flowers early in June. The branches are ramified; the young herbaceous shoots are of a reddish green. The grapes colour at the end of August and are ripe early in October; the fruit is reddish white and the plant fairly prolific. The leaves are wide, not long, five-lobed, delicate, not verry resistant to cold, distinctly toothed; the upper surface is of a fine green somewhat inclined to yellow, and fairly shining. The leaves turn colour late in the season and take a yellow tint.

Fruit. — There are two bunches on the shoot; the bunches are very large, the shoulders being long and well developed. The fruit is of good quality and in great demand for dessert; it is, however, also used for wine making.

683 - **A New Hybrid Direct Bearer.** - AURIOL, A. in *Journal d'Agriculture Pratique*, Year 77, Vol. I, No. 16, pp. 497-498. Paris, April 17, 1913.

The « Madone », a new vine from the department of Aude, has always shown itself resistant to mildew, powdery mildew and rots. The parent stem, which is sixteen years old, has yielded grafts for the last six years.

This hybrid, like the Durief and Chasselas, is an early variety and is therefore suitable for planting in the vineyards of Eastern, Northern and Central France. It shoots late, blossoms soon and ripens early; further it is suitable for growing on calcareous soil. Each shoot bears usually four bunches. As it is very vigorous and requires long pruning, it gives heavy crops. If there is frost, the eyes and resting buds produce fruit-bearing shoots with 2 to 4 bunches to the eye; and thus the crop is assured. The grapes which are shaded ripen as quickly as those exposed to the sun; this is an advantage in districts where the light is weak. The wine is bright red in colour; its alcoholic strength is from 11 to 12 degrees. The flavour is good and somewhat resembles that of the Hermitage wines.

This vine thus combines a number of qualities, which place it in the first rank of the direct bearers available for vine-growers who wish for an inexpensive crop.

684 - **Wines from Hybrid Vines at the Toulouse Exibition.** — PÉE-LABY, E. in *La Vie agricole et rurale*, Year 2, No. 19, pp. 543-547. Paris, April 12, 1913.

Already for some years, the Central Syndicate of Haute-Garonne, in cooperation with the various agricultural associations of the district, has organized an exhibition of wine made from hybrid vines. At these exhibitions, the samples presented are tasted, and as it is impossible to speak of the merits of a wine without discussing the qualities of the hybrid which produces it, a public meeting is held after the tasting, at which any person interested may give his opinion as to the cultural value of the hybrid.

The writer mentions the hybrids which have given the best results and records a perceptible improvement in the wines made from them; this allows of their increased cultivation being predicted.

685 - **The Grafting and Exportation of Green Tunisian Table Olives.** — MARZAC, F. in *Bulletin de la Direction Générale de l'Agriculture, du Commerce et de la Colonisation*, Year 16, No. 65, pp. 250-251. Tunis, Fourth Quarter, 1912.

In continuation of his previous investigations (1), which resulted in the discovery of a dozen varieties of olives suitable for preserving, the writer turned his attention to finding out which of these were the best sorts for export. The Bidh variety alone possesses the necessary qualities for this purpose. Barouni is a fine large fruit, but its flesh is coarse and its stone large, rough, and furrowed, the skin is thick, and the fruit not suitable for pickling. The other varieties are only suitable for local consumption. Bidh el Hamman is often as large as Barouni; its shape is similar to the Spanish Gordale, and its flesh is fine in texture and well-flavoured and contains a relatively small stone; this fruit fulfils all the requirements for export. The writer advises the use of this olive for grafting. Olive-growers will find it much superior to the varieties grown for oil making, both as regards its yield and the high price fetched by the fruit.

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(1) See B. Nov. 1910, p. 86. (Ed.)

686 – **Grafting Pears.** — Passy, P. in *La Vie agricole et rurale*, Year 2, No. 17, pp. 474-475. Paris, March 29, 1913.

The stocks upon which the pear can be grafted are numerous, *viz.* seedling pear, quince, hawthorn, different species of *Sorbus*, and (in Algeria) Japanese Medlar or *Eriobotrya*. In France, only seedling pear and quince are commonly used.

For standard trees which are not to be pruned, but allowed to develop naturally, and will have to resist winds and the attacks of animals, the seedling pear must always be used as stock, no matter what kind of soil is to be planted. By this means, robust trees of large dimensions are obtained, capable of producing very heavy crops after a good many years. If on the contrary, small trees are desired, which are to be pruned regularly, and the surplus crop annually suppressed, then the quince is the best stock to choose.

687 – **On the Cultivation of the Date Palm for Fruit in Sicily.** — Borzi, A. in *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo*, Year XI, Part 1-2-3 (January-September), pp. 44-60. Palermo, 1913.

The cultivation of date palms with a view to obtaining eatable ripe fruit can be successfully undertaken in Sicily, and especially in the most southern portions of the island, under the following conditions:

1). Early ripening varieties must be introduced and grown. These require less heat for ripening their fruit than the inferior kinds, and therefore are more sure to become acclimatized. The common varieties, indeed, need a minimum of 5100° C., while 4080° C. are sufficient for the early kinds. It would therefore not be difficult to grow certain varieties in Sicily, where the sum total of the temperature varies between 3650° C. and 3800° C. The same result can be obtained by cultivating very late varieties, which are capable of enduring low winter temperatures without the loss of their already-formed fruits. The latter would ripen at the end of the spring, or during the summer of the following year. This method would also have the advantage of supplying dates before the African fruit was on the market.

2). Another plan would be to grow *Phoenix melanocarpa* Naudin, care being taken to prevent the propagation of this species by seed. The fruit of this date palm is black and if not at once a favourite for table purposes, its excellence would soon ensure its sale, especially as it would appear on the market in the early summer. It is perhaps well to add that this type of date palm is well adapted to the milder climate of other Mediterranean districts.

3). It is necessary to try and obtain, by hybridization and selection, species or varieties which are capable of being thoroughly acclimatized to Sicily. For this purpose, advantage can be taken of the extraordinary capacity for variation possessed by the date-palm (hundreds of cultivated varieties being known), and of the facility with which crosses can be made between all species of the genus *Phoenix*. *Ph. canariensis* would be a good species for the creation of hybrids, since this tree extends beyond the hot arid zone of *Ph. dactylifera* and grows in latitudes where the temperature descends at times below 10° C. Further the fact that the Canary Date Palm is capable of propagation when often only 8 or 10 years old, at least in the climate of Sicily, would greatly facilitate the solution of the problem.

688 – **A Wind-break tested in Libya.** — *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo*, Year XI, Part 1-2-3 (January-September), pp. 37-39. Palermo, 1912.

Myoporum serratum, which about thirty years ago was pointed out by Barzi as a suitable plant for arid and sandy soils and which was recently recommended by Fiori for the fixation of dunes and by Bruttini (1) as a wind-break in Libya, has been successfully tested at Bucamez (Western Tripoli), where it throve on sand infiltrated with brackish water, showing perfect resistance to the unfavourable conditions of climate and of soil. At present they are the only green plants existing on that shore.

689 – **Forestry in China.** — MONTAGUE, H. T. and WOODHEAD, H. G. W. *The China Year Book* 1913, *passim*. London.

Deforestation has played an active part on the surface of China, with the result that large forests in China proper are rare. They are met with, however, in certain districts of Central Asia, in S. E. Tibet and in Mongolia and Manchuria. In Estern Turkestan are to be found birch, pine, fir, spruce, larch, and poplar, while in the less favoured districts artemisia and tamarisks relieve the stretches of reeds and coarse grass that cover the steppes. In S. E. Tibet may be seen juniper, willow, pines, firs, cedars, elms and a large species of holly; while in the sheltered valleys grow wheat, barley, rice, fruit trees and vegetables. The medicinal rhubarb-tree is also a native of these plateaux. The tree grows to a height of eight or ten feet and the rhubarb of commerce is its root, dug up early in spring, cut into long flat pieces and dried. Dwarf elms and willows are met with in the Gobi Desert. In northern Mongolia and Manchuria the same trees reappear, together with oak and walnut.

Chinese timbers include pine, fir, maple, ebony, oak, camphor, teak, mahogany, birch, plane, elm. In this category may be mentioned the bamboo, which looms so largely in the everyday life of the Chinese. With it they build houses and erect temporary shelters; it is used for all scaffolding purposes, and for the transport of all goods by human agency. In early life it is used for food; when full grown it supplies the vast water population with masts, and from it are made chopsticks, pipes, umbrellas, tables, stools and musical instruments. Between forty and sixty varieties of bamboo are said to be known to the Chinese.

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(1) See No. 1429, *B.* Oct. 1912. (*Ed.*).

Among other trees worthy of mention are the varnish tree (*Rhus vernicifera* D. C.), the tallow tree (*Stillingia sebifera* Michx.), wood-oil tree (*Aleurites cordata* Stend.), and vegetable wax tree (*Fraxinus chinensis* Roxb.).

Twelve species of rhododendron are met with in Szechuan, where rhododendron forests are found at altitudes ranging from 2000 to 12 000 ft.

China has to import timber to satisfy its own needs, nearly as much wood entering China from abroad (£ 539 730 worth in 1911) as is obtained within its borders for purposes of local trade through the Customs (in 1910 £ 641 969). Foochow poles (fir and pine) are the chief feature of the industry. The forests are owned by private individuals, and timber is felled all the year round, while replanting is only done spasmodically. In this respect Fukien province resembles the rest of China. The main supply of timber has hitherto come from twenty-three districts in the prefectures of Yenping, Kienning, Shaowu, and Tingchou. The poles, using various streams, collect at Nantai, where in the aggregate they reach an annual value of £1 000 000. Hankow in 1910 for the first time surpassed Foochow as the chief port of the trade, with Antung, the port of export for Manchurian timber brought from the Yalu, and Kowloon, next in order. The timber trade of Wuchow (Kuangsi), mainly in junks, is however estimated at £250 000. The output of the Yalu Timber Company for 1910 is given as 800 000 logs of 8 feet long. A dividend amounting to £150 000 was paid, equivalent to 5 per cent. on the original capital.

Examples of afforestation are being set by the Chinese in the Honkong leased territory at Weihaiwei, in the German territory of Kiaochou, and by the Chinese Engineering and Mining Company at Tongshan, Chihli. Little attempt has been made by the Chinese to profit by these examples, but a writer in a recent *Bulletin* of the Royal Botanic Gardens, Kew, mentions that among the hill men or Hakkas of Kuangtung province the practice of forming plantations, mostly of pines, on the hills round their villages is becoming general; but they have not developed a sound principle of forestry and therefore obtain only a scanty return for the labour expended upon it. It is indeed quite a rare thing to see any trees planted by the Chinese permitted to attain their proper development for market purposes.

The State Forest administration is attached to the Ministry of Agriculture and Forestry (Nung Ling Pu). The following official system was promulgated on August 8, 1912.

The Minister of Agriculture and Forestry has control over all matters regarding agriculture, irrigation, forestry, the breeding of domestic animals, sericulture, pisciculture, reclamation of waste lands, and of all yamens established therefor, and officials connected therewith.

The General Office of the Ministry, besides fulfilling the duties provided for under the General Rules common to all Ministries, shall undertake the following:

a) All matters concerning Forestry and Agriculture.
b) Agricultural and Forestry Exhibitions and Conferences.
c) Investigations abroad in connexion with Agriculture and Forestry.

The Ministry shall contain the following Departments:

a) General Agricultural Affairs.
b) Reclamation.
c) Forestry.
d) Fisheries and Marine Products.

The Forestry Department shall supervise the following:

a) Encouragement and supervision of afforestation.
b) Conservation of forest.
c) Government forests.
d) Organization of forestry enterprises and control of same.
f) Other matters relating to forestry.

690 - **A New Method for the Afforestation of the Sandy Portions of the Great Hungarian Plain (Alföld).** — KISS, FERENCZ (Chief Counsellor of the Department of Water and Forests) in *Erdészeti-Lapok*, Year LII, Part VII, pp. 296-318. Budapest, April 1, 1913.

The report presented on March 14, 1913, to the National Forestry Society and dealing with the afforestation of the sandy parts of the Great Hungarian Plain. This afforestation was intended at the beginning to protect the neighbouring pastures and cultivated land from the encroachment of the moving sands of the adjacent steppes. The work was begun 100 years ago, and its economic utility was only considered after the continued labours of a century had unexpectedly been crowned with success. At first, black poplars were planted, and it was only in 1870 that *Robinia* took exclusive possession of the wooded portions of the Alföld. The writer gives a biological study of the flora of the Great Hungarian Plain, including *Robinia*, which tree, in his opinion, is not capable of improving the poor soil. He recommends a new method, whih does not confine itself to the afforestation of land suitable for tree plantations, but extends to the reclamation and improvement of a large portion consisting of sandy soil and sandhills, which hitherto has been little used owing to the poverty and dryness of the land. The writer attests the excellence of Austrian pine for preliminary planting, as it renders the soil suitable for the cultivation of more remunerative forest trees.

LIVE STOCK AND BREEDING.

HYGIENE

691 - **Oxidation of the Arsenite of Soda in Dipping Tanks.** (1) — WILLIAMS, C. in *The Agricultural Journal of the Union of South Africa*, Vol. V, No 1, pp. 68-74. Pretoria, January 1913.

The writer mentions some facts observed by him in the laboratory of the Central Experiment Farm, Cedara, Natal, namely that some samples of arsenical dip fluids after being kept in the laboratory for a short time often showed a distinct loss in arsenite. The amount of total arsenic in the fluid remained constant; there was consequently an oxidation of the arsenite with formation of arsenates.

The writer quotes an article by Messrs. W. F. Cooper and G. A. Freak, in the *Journal of Agricultural Science* for October 1911, and the circular by Audrey V. Fuller, issued by the United States Department of Agriculture. In the latter the oxidation of the arsenite was attributed to the action of bacteria present in dip fluids under natural conditions. These bacteria possibly gained access to the tanks either through the water used in preparing the dip, or through the air or by the excrementitious or other matter derived from the live stock passing through the dip.

In the second half year of 1912 the writer conducted two series of experiments, in connection with the subject, in the laboratory at Cedara. Three dip fluids were prepared. The first was made up of sodium arsenite in pure water; the second contained excretory matter in addition, but otherwise was similar to the first; the third was made up according to Pichford's formula (arsenite of soda, paraffin and soft soap), with the addition of some excretory matter. Each dip was analysed immediately after it was prepared and also at the end of every month, for five months, the arsenite and the total arsenic being determined as arsenious oxide, As_2O_3. The amount of total arsenic remained constant in each sample; while the arsenite did not undergo any oxidation whatever in the first dip, it diminished rapidly in the other two dips, practically disappearing within two or three months.

A second series of investigations was carried out with a proprietary arsenical dip, kept in the open in the tanks, and in the laboratory in closed vessels. The data thus obtained bear out Cooper and Freak's conclusions, that the oxidation of the arsenite is far more rapid in the summer months than in the winter, owing doubtless to the greater activity of the bacteria at the higher temperatures.

Referring to the fact that sodium arsenate is much less efficacious as an insecticide than the corresponding arsenite, the writer points out the vital importance of the question to stock owners, and considers it essential that they should have the contents of their tanks analysed regularly in order to have estimated the amounts of both arsenites and arsenates in the fluid; for by the neglect of this precaution they would run great risks.

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(1) See: No. 2198, *B.* July 1911; No. 2425, *B.* Aug.-Sept.-Oct. 1911; No. 146, *B.* Jan. 1912, Nos. 358 and 359, *B.* Feb. 1912; No. 810, *B.* May 1912; No. 934, *B.* June 1912; No. 43, *B.* Jan. 1913. (*Ed.*).

692 – **Destruction of the Pathogenic Agent of Foot-and-Mouth Disease: Experiments in Specially Constructed Manure Heaps.** — LOEFFLER, F. in *Berliner Tierärztliche Wochenschrift*, Year 29, No. 7, pp. 113-115. Berlin, February 13, 1913.

It has often been proved by experiment that temperatures of 60 to 70°C. (140 to 160° F.) may exist in manure heaps. As the agent of foot-and-mouth disease is killed by still lower temperatures, it may be concluded that manure from animals suffering from this disease is disinfected, if it is so kept that its temperature rises to 50 to 70° C. (120 to 160° F.) Hitherto, however, this had not been proved.

In 1912, the writer prepared a manure heap in such a manner that this temperature was quickly attained. He introduced the pathogenic agent into the manure and a few days later used it for inoculation.

The experiment was carried out as follows. A layer of straw 10 inches thick was laid down upon a concrete surface 9 ft. by 8 ft. to serve as a base upon which to pile up the manure. The latter was a mixture of fresh cow and pig manure containing much straw. In the experiment, fresh lymph was used; it was mixed with a 0.9 per cent. solution of common salt in the proportion of 1 to 20, and filtered through Chamberland filters; 15 cc. of this mixture was put into test-tubes, and some tubes of lymph were kept in the cellar to serve as a control of the virulence. In addition, the hoofs of a pig which had died of foot-and-month disease, were cut off, wrapped in gauze, and introduced. The writer used 12 numbered maximum thermometers for the measurement of the temperature. The thermometers, hoof-parings and lymph-tubes were equally distributed in the heap while it was being built up. Another thermometer was put between the layer of straw and the manure. The heap was built up like a mangel-clamp and pressed down with forks; it was then covered with a layer of straw 4 inches thick, upon which was thrown a layer of dry earth of the same depth; the total height of the heap was 6 feet. After ten days, the manure was again spread and the thermometers, lymph and hoofs removed. The different thermometers registered from 55.5 to 75° C. (132 to 167° F.).

Pigs were then inoculated with the lymph and also with the hoof-extract, but they did not fall ill; but when inoculated with the control lymph they sickened. Thus the pathogenic agent must have been destroyed by the heat of the manure heap. It is therefore possible to make the manure from animals suffering from foot-and-mouth disease entirely free from infection, if the heap is constructed and managed in the manner described by the writer.

693 – **The Internal Application of Carbolic Acid for the Prevention of Contagious Abortion in Cattle. The Relation of Granular Vaginitis to Abortion.** — TAYLOR, W. J. in *Bulletin of the Montana Agricultural College Experiment Station*, No. 90, pp. 19-31. Bozeman, Montana, July 1912.

The experiments commenced in 1909 in three herds seem to warrant the following conclusions:

1). Carbolic acid, either fed in solution or injected hypodermically, seems to be a specific against contagious abortion.

2). Cows, as a rule, will eat with apparent relish as much as 750 cc. of a 4 per cent. solution of carbolic acid in feed daily.

3). The hypodermic injection as a treatment in an affected herd involves less labour than feeding.

4). In cases of impending abortion, carbolic acid can be injected in sufficient quantity to cause staggering gait and dilation of the pupil of the eye (when it should be withheld for from ten to fifteen hours and repeated) with no apparent unsatisfactory after-effects.

5). All males used for breeding purposes should be treated with carbolic acid either hypodermically or in the feed. The penis and sheath should be thoroughly disinfected, both before and after service. Contagious abortion and granular vaginitis may be transmitted through the medium of the male, unless proper precautions are observed.

6). Not all cows showing granular vaginitis abort.

7). Heifers pregnant for the first time are more liable to abort thad during subsequent periods of gestation and should be carefully watchen and vigorously treated, if abortion exists in the herd.

694 - Plants Poisonous to Live Stock in Paraguay and in Misiones (Argentina).

BERTONI, MOISÉS S. in *Agronomia, Boletin de la Estación Agronomica de Puerto Bertoni*, Vol. V, No. 3-4, pp. 140-144. Puerto Bertoni, Paraguay, January-February 1913.

The writer agrees with Spegazzini that the toxicity of poisonous plants is generally due more to the stage of their growth than to their specific character. Besides, the quantity eaten by the animals, the age of the plants, and the conditions of climate and soil affect the degree of toxicity. There is no doubt that pastures with very young grasses are the most dangerous; it is well known that many herbaceous plants in their early stages contain hydrocyanic acid. In other plants this acid may be formed in the parts that are cut and kept for a few hours.

In Misiones there are several plants in the pastures which are poisonous when they are very young. Such are — according to the writer's observations — the Gramineae *Cynodon dactylon, Andropogon halepensis, A. condensatus* (« aguarà-ruguài » or « cola de zarro »), *A. bicornis* (« caapi San Juan »), *Panicum sanguinale* (« kaapii-ahſhi » or « falsa cebadilla de Misiones »). There are, however, some exceptions: castor oil plants are harmless when young and become poisonous when adult; the species of *Tragia* and of *Dalechampia* are harmless when young, but they are to be regarded with suspicion when grown up.

It is also known that drought and the compactness of the soil increase the toxicity of certain plants; in other plants, on the contrary, the writer has observed that they become more poisonous after abundant rain. Such is the case with some of the above-mentioned Gramineae, and perhaps manioc.

Among the poisonous or dangerous plants, the writer mentions further: *Commelina sulcata*, a species of *Tradescantia* (called « trapuerava » in Brazil), *Bromelia fastuosa, Tragia volubilis* («ihsihpó-pihnò »), *Manihot Tweedieeana* (« guazú-mandio »), some Euphorbiaceae, *Polygonum acre* (caá-tás), *Brunfelsia Hopeana* (« jazmin del Paraguay » or « azucena », but rarely eaten by animals), *Solanum sisymbriifolium* (« revienta caballos » or « putui»), *Tabernaemontana Hilariana* and *T. australis*, *Spaticarpa sagittifolia* (which is avoided by live stock), *Equisetum giganteum* (which contains aconitic acid, or a nearly allied substance). The writer adds that this list is certainly still incomplete.

ANATOMY AND PHYSIOLOGY

695 – **Investigations into the Micro-Flora of the Large Intestine of Cow and Sheep.** — CHOUKEVITSCH, JEAN in *Annales de l'Institut Pasteur*, Year 27, Vol. 27, No. 3, pp. 246-263. Paris, March 25, 1913.

The writer investigated the colon and caecum of five cows and five sheep, and found that the micro-flora in the organs of these two kinds of animals was not very dissimilar. The bacteria present in the large intestine of the cow are chiefly cocci and rod-bacilli; coli-bacteria always occur in large numbers; strepto-cocci, often in the degeneration stage and encysted, are present in largest numbers in the caecum, or in the upper part of the colon. Towards the rectum, the signs of degeneration become increasingly clear. The short-rods, which often occur in reduced numbers, form no spores within the intestine; they measure 0.3 μ by 4 to 6 μ. The micro-flora of the colon of the cow differs from that of the horse (previously studied by the writer) in that the rare bacteria are more numerous in the former; also the bacteria in the cow's intestine seem to preserve their morphological characters better. To determine the species, the most varied cultures were made and the writer succeded in isolating, in addition to those already mentioned, the following species.

I. Agents of putrefaction : *Bacillus proteus vulgaris, B. Welchi, B. putrificus, B. sporogenes A, B. sporogenes B, B. sporogenes foetidus, B. sporogenes parvus.*

II. Proteolytic bacteria (not including agents of putrefaction): *Bacillus Ellenbachensis, B. hastiformis, B. flavescens liquefians, B. amylolyticus, B. mesentericus, B. megatherium, B. pyocyaneus, B. mycoides, Chlostridium proteolyticum.* In *B. mesentericus* the *ruber*-form was found more commonly than the *vulgatus* form.

III. Bacteria decomposing cellulose, hemicellulose and starch : *Bacillus gazogenes, Bacterium Rodella III, Bacillus amylobacter* (*butyricus*), *B. amyli tenuis, B. Welchi, B. mesentericus, B. Ellenbachensis, B. amylolyticus, B. mycoides.* The formation of gas in the colon is attributed to the Rodella III group.

IV. Bacteria of acid media: *Bacterium Merejkowsky I, B. Moro, Streptobacillus anaerobicus magnus, Bacterium rosescens, Bacillus megalosporus, B. tenuis*; occasionally a coccus resembling *Micrococcus candicans* was isolated.

Of these bacteria, some always occur in the intestine, forming the constant micro-flora of this organ : *Bacterium coli*, cocci, *Bacterium Moro, B. Merejkowsky I, Bacillus Welchi* (*perfrigens*), *B. putrificus, B. sporogenes A,* *B. hastiformis*, *B. flavescens*, *B. gazogenes*, *B. Ellenbachensis*, *B. mesentericus*, *Bacterium Rodella III*, and those decomposing cellulose. *Bacillus amyli tenuis* is probably also constantly present.

In sheep, the micro-flora is richer in species ; streptococci are more numerous and usually more degenerated. In addition to those mentioned as found in the intestine of the cow, the following were isolated : *Bacillus tenuis non-liquefaciens*, *B. irregularis*, *B. ramiformans*, *Sarcina flava*, *Vibrio terrigenes Güntheri*, *Actinomyces albus*, *Bacillus hervolvulus Zimmermanni*. The following always occur in the colon : *Bacterium coli*, cocci, *Bacterium Moro*, *B. Merejkowsky I*, *Bacillus Welchi*, *B. putrificus*, *B. sporogenes A*, *B. sporogenes B*, *B. mesentericus*, *B. Ellenbachensis*, *B. hastiformis*, *B. flavescens*, *B. gazogenes*, *B. amyli tenuis*, *Bacterium Rodella III*, cellulose-decomposing bacteria.

As the writer found a similar flora in horse, cow and sheep, and always bacteria which decompose cellulose, hemicellulose and starch, he considers that the composition of the flora depends less upon the species of animal than upon the kind of food consumed by the latter. In a later work the little-known species will be described.

696 – **Fluctuations in the Body Temperature before Parturition in Cow, Sheep and Goat.** — LIMMER in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 13, pp. 149-150. Hannover, March 28, 1913.

The results of the examination of the body temperature at the end of the last period of gestation in the case of 50 Black-spotted Lowland cows and of sheep and goats were as follows : The temperature rises during advanced gestation and sinks again before parturition ; the fall begins in the case of the cow at 11 ½ to 56 hours before calving and in that of the sheep a week before lambing. In goats, a second decrease in temperature occurs one day previous to parturition.

697 – **The Pepsin and Chymosin Question.** — RAKOCZY, A. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 84, Part 5, pp. 329-353. Strassburg, 1913.

Experiments on the coagulation and digestion of milk in the stomachs of various mammals, according to which young ruminants, foals and pigs secrete, as well as pepsin, an independent ferment (chymosin) which coagulates milk. Opossums only produce pepsin, and the milk is coagulated by the action of this ferment. As neither pepsin nor chymosin is found in the stomachs of dogs and cats, the causes of milk coagulation in their case are unknown.

698 – **Report of the Zoometrical Studies made in 1912 at the Shows at Paris, Rouen and Poitiers.** — VOITELLIER in *Bulletin Mensuel de l'Office de Renseignements Agricoles*, Year 12, No. 1, pp. 46-63. Paris, January 1913.

The measurement data and the live weight estimations made on specimens of most of the French breeds of cattle, of three breeds of sheep (Charmoise, Oxford Down, Dishley-Merino), and of one breed of donkeys (Poitou). The height at the withers was taken as a basis for the measurements.

BREEDING

699 – **The Fertility of Hybrids in a Mammalian Species-Cross.** — DETLEFSEN, J. in *American Breeder's Magazine*, Vol. III, No. 4, pp. 261-265. Washington, October, November, December 1912.

Sterility is a common phenomenon in the hybrids obtained by mating members of distantly related groups or types, in both animals and plants. In case both sexes are sterile, a further genetic study becomes impossible. When one sex alone among the hybrids is sterile, that sex is usually the male; and since the females are fertile, it becomes possible to study their inheritance of characters and fertility of offspring by crossing them back to the males of either parent species.

Among mammals, at least, work on inheritance and fertility in species crosses is in its inception. The consensus of opinion is that the cross between horse and ass results in sterile male mules, but that the female mule is occasionally fertile with either the horse or ass (Waldow von Wahl, 1907). The zebroid (zebra × horse) in supposed to be sterile in both sexes (Ewart 1899; Ivanoff 1911); the same is true of the zebrule (zebra × ass). When the cow and bison are crossed, they produce fertile female catteloes, but sterile males (Bond, 1908; Ivanoff, 1911). These female hybrids were crossed back to males of both parent stocks: the one-quarter bison females are fertile; the three-quarters were not fully tested, but are possibly also fertile. The one-quarter bison males are not always fertile, but Ivanoff reports a fertile three-quarters bison male.

The writer worked out the progeny of a cross between the wild Brazilian cavy (*Cavia rufescens*) and the domesticated guinea-pig (*Cavia porcellus*). The two forms differ consistently and clearly in colour, texture of hair, size, shape of skulls and skull sutures, tooth formation, etc. The original crosses between the two species were the result of mating the wild males to the tame females, but matings were secured with much difficulty. The reciprocal cross was not attempted, as it was feared that the smaller wild female would succumb in pregnancy when mated to the much larger tame males. The tame females bore their hybrid young in due time and with the usual guinea-pig average per litter, thus proving that the wild males were wholly fertile.

Having obtained these half-wild hybrids, the females were mated back to the wild males and the tame guinea-pig males, producing three-quarters and one-quarter wild respectively. The matings to the wild males were not very successful, and only one three-quarters wild male was reared to maturity. The latter proved sterile. The matings to the tame males were wholly successful and produced 83 one-quarter wild. The hybrid females of one generation back were mated to tame guinea-pig males and over 1700 hybrids of various blood dilutions were produced, ranging from ¼ wild to $^1/_{512}$ wild.

The problems to be resolved were as follows: how great must be the blood dilution, or for how many generations must the hybrid females be crossed back to the guinea-pig, to eventually produce fertile male hybrids? When fertile male hybrids are produced, would their offspring be fertile in both sexes, if such males were mated to their hybrid sisters or guinea-pig females?

The breeding test being hardly sufficient to decide an animal's fertility, the writer devised a new test. He obtained a complete index of the males' fertility by making a small incision in the scrotum, puncturing the epididymis at one or two points and examining the liquid contents with the aid of a microscope. There was a great difference between individual hybrids; some males might not possess any sperm at all, but in their place were found a few, or many, incompletely matured spermatogonia; others possessed a few non-motile or motile spermatozoa in addition. Still others might have an abundance of motile spermatozoa, just as any normal male. All grades and combinations were found; but the last class alone could be successfully mated to females. The fertility of the hybrid males is shown by the following table:

Class of hybrids	Total number tested	Per cent. with any sperm	Per cent. with any motile sperm	Per cent. readily fertile
1/2 wild	6	0	0	0
1/4 »	22	25.0	0	0
1/8 »	71	47.8	17.3	9.8
1/16 »	94	71.1	46.6	35.5
1/32 »	89	88.7	62.9	60.7
1/64 »	21	100.0	66.7	66.7

After a careful examination of the mobility of the spermatozoa, the writer considers that every male which has an abundance of motile spermatozoa is undoubtedly fertile. Such fertile males are especially numerous in hybrids with least wild blood, as is shown by the table.

The male hybrids derived from crosses between a fertile male hybrid and a female hybrid, gave all grades between absolute sterility and fertility; but when a fertile male hybrid was mated to a guinea-pig female, all the male offspring were fertile.

The guinea-pig colour, coat, size and anatomical characters were transferred to the hybrids. Any combination of these characters may be united with fertility. It is conceivable that desired characters in hybrids between other mammalian species (including cattaloes and mules) may be combined with fertility of both sexes, in the same manner.

700 – **Mendelism and Interspecific Hybrids.** — COOK, O. T. in *The American Naturalist*, Vol. XLVII, No. 556, pp. 239-245. Lancaster-Garrison-New York, April 1913.

A criticism of Dr. Nabour's treatise on crossing *Bos indicus* with *Bos taurus*, which appeared in No. 547 of the above-mentioned periodical (1).

WORK OF LIVE-STOCK ASSOCIATION AND OTHER FOR THE ENCOURAGE MENT OF BREEDING

701 – **The Exportation of German Stud Stock, especially to the Colonies.** — NEUMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, pp. 311-313. Berlin, March 29, 1913.

The writer estimates from the official statistics that in 1909, 7128 horses were exported from Germany, of which 5123 were horses for the knacker, 929 draught horses, 798 carriage, riding and race horses, 99 ponies, 97 stallions and 82 foals. The horses for slaughter and those used for purposes other than breeding, were chiefly sent to Switzerland, while the stallions went to the Netherlands and the foals to Austria-Hungary. German stud horses were also imported by Belgium, Denmark, France, Russia, Sweden, Switzerland, the United States (28 stallions), Brazil, German South-West Africa (8). Many animals of the Holstein, Oldenburg, Hanoverian and East Prussian breeds were exported.

In 1909, 10 455 head of cattle were exported, of which 36 per cent. were bullocks for the butcher. Most of the butcher's beasts were sent to Switzerland, the stud cattle going to Austria-Hungary, Russia (255), German South-West Africa (73), Kamerun (7), Chile (12), Brazil (5), and the United States (3). The Black-spotted Lowland cattle are in much request abroad, especially in Russia and Austria-Hungary. Red-spotted Holsteins, and especially Angles, are prized in the Russian Baltic Provinces. In addition were exported cattle of the Grey-Brown Mountain, Höhen Spotted (to Russia, Argentina, China), Frankish, Red Central German, Pinzgau and Algäu breeds.

Of the 53 889 sheep exported the same year, most of those destined for mutton were sent to Switzerland. German stud sheep went to Russia, Austria-Hungary, France, Denmark, Servia, British South Africa, German South-West Africa, Australia, Brazil, Uruguay and Chile.

The number of goats and pigs exported was negligible.

The exportation of cattle to German East Africa, German South-West Africa and Kamerun is attended by the following restrictions which came into force on January 8, 1913.

1) Cattle may only be exported from districts which are declared free from foot-and-mouth disease, and from herds in which there has been no case of this disease for eight months.

2) The vendor is required to produce official proofs of the fulfilment of these conditions.

3) Animals may only be exported from Hamburg, and before embarkation must remain for 14 days under observation at the inspection station established by the German Agricultural Society in that city (2).

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(1) See No. 1318, *B*, Sept. 1913, for a notice of this article. (*Ed.*).

(2) Founded in 1909.

4) On arrival in the Colonies, the cattle are subjected to 28 days' quarantine.

702 - **Small Breeders' Associations in Italy.** — VEZZANI, VITTORINO. — *Pubblicazioni del Comitato Nazionale per la Mutualità agraria*, pp. 156. Rome, 1913.

Breeding Syndicates have arisen during the last thirty years and have spread throughout Europe. They are especially numerous in Austria, Belgium, Denmark, Germany, Norway, Holland, Sweden and Switzerland; while they are in course of formation in France, Italy and Russia; Japan has already a good number.

According to recent statistics of the ministry of Agriculture, Italy now possesses 133 Associations of this description, of which the greater number have come into existence during the last seven years.

In Italy, the most suitable legal form for Breeding Societies is that of the ordinary Civil Association in the case of syndicates without share-capital, and of the Cooperative Society in that of syndicates with share-capital.

The Horse Breeding Syndicates, which have been established in Italy under the name of "Consorzi Stallonieri", use most of their share-capital for the purchase and maintenance of a selected stallion to serve the mares belonging to the members.

The Cattle Breeding Associations are of greater importance to Italian agriculture, on account of the great development of the cattle-breeding industry. The Breeding Syndicates have assumed different forms, ranging from the most simple to the most complex. There are so far, with one exception, no societies for the improvement of sheep, goats and pigs, nor any small poultry associations.

No Federations of Breeding Syndicates yet exist in Italy.

703 - **List of Stud Book Associations.** — *Illinois Stallion Registration Board, Bulletin* No. 3, pp. XVII + 254. November 1, 1912.

This bulletin contains a list of all the American and Foreign Stud Book Associations authorized by law, which are the only associations that the Illinois Stallion Registration Board is permitted to recognize (see Section 7, Law regulating the Public Service of Stallions in Illinois, amended June 5, 1911). A directory of the licensed stallions on November 1, 1912, is given, with their number, breed, date of foaling and the names and addresses of their owners. There are now 9677 stallion licences in force; of this number 5688 are for pure-bred horses, 3984 for grades and 5 for cross-breds.

704 - **The Annual Live Stock Show at Santiago, Chile, in 1912.** — La Exposicion Anual de Animales. — *Boletin de la Sociedad Nacional de Agricultura*, Vol. XLIII, No. 11, pp. 689-713. Santiago, November 15, 1912.

An account of the annual live stock show organized by the National Agricultural Society (Sociedad Nacional de Agricultura), which was opened on October 16, 1912.

There were 570 head of horses and cattle exhibited, as well as poultry.

A complete list is given of the prizes awarded, and the article contains photographs of some of the animals.

705 - **The Shire Horse Show.** — *Live Stock Journal*, Vol. LXXVII, No. 2030, pp. 210-215. London, February 28, 1913.

In February 1913 the thirty-fourth annual show of the Shire Horse Society was held. The prize money and breeders awards amounted to £ 2230 and the number of horses entered was 685: The article gives a detailed description of the various sections and the list of prize winners.

706 - **London Hackney Show.** — *Live Stock Journal*, Vol. LXXVII, No. 2031, pp. 239-246. London, March 7, 1913.

The twenty-ninth annual show of the Hackney Horse Society was opened at the Royal Agricultural Hall, Islington, on March 4, 1913, and was continued until the evening of March 7. The entry was some 572, against 611 last year. The prize money amounted to £1844. This article describes the exhibits in the 43 classes, and gives a list of awards made up to the evening of March 6.

707 - **Thoroughbred and Hunter Show.** — *Live Stock Journal*, Vol. LXXVII, No. 2032, pp. 270-274. London, March 14, 1913.

The twenty-ninth annual London Show of the Hunters' Improvement and the National Light Horse Breeding Society was opened on March 11. The number of horses entered was 306, and £ 9850 were offered in Premiums, Super Premiums and prize money.

The article describes the various classes of Thoroughbreds and Hunters, and gives the list of the prize winners.

708 - **Report of the Eighth Systematic Show of Milch Cows of the Brown Breed on September 28, 1912, at Crema, Italy.** — *Pubblicazione della Cattedra ambulante d'agricoltura e del Comizio agrario di Crema*, pp. 34. Crema, 1913.

An illustrated brochure with a preface written by Dr. Z. Camertoni explaining the aim, organization and importance of the Crema show, and giving the reports of the judges of the fourteen sections (the system of having *one judge* being maintained) as well as the complete list of the prizes awarded.

709 - **The Italian Artillery Horse.** — PIROCCHI, ANTONIO in *Giornale d'Ippologia*, Year 26, No. 7-8, pp. 3-7. Pisa, April 1, 1913.

The question of the breeding of artillery horses is one of great importance for Italy.

After considering the nature of the work required of these horses, the writer gives a list of the qualities necessary for them. From the point of view of build, the artillery horse, especially the wheel-horse, which has the heaviest work, should be thick-set, with very short legs, solidly built; straight, short and broad in the body, and supported by strong legs, with straight action. According to the excellent description given by Capitain Ajroldi the wheel-horse comes at the limit of the category of fast heavy horses, belonging to the lightest of these, or at the limit of light horses, being the heaviest of these.

Its weight should be considerable, and varies from 1100 lbs. to 1200 lbs. The height at the withers should be equal to the length taken from the point of the shoulder to the end of the rump. In general, the height at the withers should vary from a minimum of 15 hands to a maximum of 16 hands, while the optimum is between 15.2 and 15.3. The transverse development of the body should be great, and the girth should exceed the height by one-eighth.

Blood is a very important asset in the case of the off wheel-horse, and is indispensable to the near mounted horse. The more rapid the work the more breeding is required; but this should never be excessive, as what is most necessary is the maximum equilibrium between the working of the nervous system and that of the organs of locomotion. Artillery horses should be quiet and stand cannon fire well. They must trot more or less fast according to the type of artillery for which they are intended. Further, they must be able to stand great fatigue, and under the worst possible conditions; in fact they must above all be very strong and possess much staying power, which latter can be developed by systematic exercise.

Without dwelling upon the very complicated question as to the best manner of increasing the production of artillery horses in Italy, the writer devotes a few words to certain fundamental points whose observance is necessary for the solution of the problem.

These may be summarized as follows:

1) It is necessary to study thoroughly the horses of the different districts of Italy, in order to be able to form horse-breeding zones and to determine the course to be followed in each of these for the purpose of rearing horses for the army.

2) By means of propaganda, horse shows and competitions, and so-called traction races, etc., it is well to make the breeders acquainted with the qualities necessary for the artillery horse and the rules to be followed in breeding and rearing it.

3) The breeders should be assured of obtaining a remunerative price for their horses; this might be effected by raising the prices and giving special prizes, so that the profit to be gained may act as an incentive to the production of the horses which are needed.

710 - **Marsh Ponies of the United States.** — CURTIS, R. S. Marsh Ponies of our Eastern Coast. — *The Breeder's Gazette*, Vol. LXIII, No 4, pp. 191-192. Chicago, January 22, 1913.

The Marsh Ponies of the eastern coast of the United States probably owe their origin to the numerous groups of small horses which have lived for some centuries in a half-wild state on the narrow banks of land adjacent to the shores of Virginia, the Carolinas and to some extent further south along the coast of Georgia and of Florida.

The soil of these banks and islands is very sandy and often marshy, and the vegetation growing upon it so poor as to seem to preclude the persistence of a breed of horses even of this diminutive size.

The banks of the greatest importance in the production of these ponies are found to the east and north of Pamlico Sound, and more especially those islands or banks just east of Carteret county (North Carolina).

The writer has made some researches on the origin of these half-wild horses and after mentioning the opinions of several authors, he concludes by affirming the possibility that marsh ponies are the descendants of horses imported by the first settlers, it appears towards the end of the sixteenth century.

The ponies, which graze in full liberty on the islands of the coast, belong to several owners who brand all their animals. Every year during May, June, July and August the whole drove from each of the banks is rounded up in pens and the colts following their mothers are caught and a brand is put on them corresponding to that of the mother. In this way each owner is enabled to recognize his stock at future pennings. All yearlings which are found without brands are turned over to the drivers to be disposed of; thus all discussion is avoided.

The ponies sell on the banks at $50 (£10) to $75 (£15), and even more for the better ones. The younger ones fetch from $25 (£5) to $35 (£7) each.

After the penning the ponies which have not been disposed of are allowed to return to their accustomed haunts, where they gather during the breeding season, each stallion with a band of mares. In the foaling season the mares select a secluded spot, where they remain until after their maternal duties are over.

The stock of the low lands runs 10 to 12 hands in height, while in some favoured conditions the size may be considerably larger. Their colour varies greatly. Some are bay with some inclination to shade into a mouse colour, others blood bays, dark brown, cream, sorrel and mouse colour, etc.

The ponies are very hardy and seviceable for light work. When first taken from their home they are somewhat shy and when they come in the early season they are covered with a long thick mossy hair. With proper grooming and feeding this can soon be removed and the coat becomes sleek and glossy. When properly cared for they possess considerable beauty. They have very shapely heads, fairly clearly-cut lines and clean legs. The feet are rather tough and small. They make very serviceable saddle ponies and light drivers. On the coast they are used to broad-tired carts by the farmers and fishermen.

According to reliable statements, about 150 ponies are raised each year in Carteret county. From Beauport inlet to Portsmouth near Ocracoke inlet, it is estimated that there are 1100 ponies on the beach.

No particular attention seems to be paid in the Carolinas to the improvement of these animals, the owners being satisfied with the present sufficient remuneration.

711 – **The Poitou Mares of France.** — ASHTON, J. in *The Breeder's Gazette*, Vol. LXII, No. 11, pp. 663. Chicago, March 12, 1913.

A short account of the mule-breeding industry and a description of the Mulassière breed of mares used, of which there are about 25 000 in the old province of Poitou. The annual production of mules is about 12 000 head. The writer also gives data respecting mule rearing and feeding, the trade in these animals (which are mostly exported) and the average prices they fetch. Small mules are sold at from $200 to $220; larger animals at $240 to $290, and a few even reach $360.

CATTLE

712 – **The Inheritance of the Property of Milk Production and the Utilization of the Results Obtained by the Control Society.** — PETERS, J. in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 11, pp. 121-125; No. 12, pp. 133-135; No. 13, pp. 145-149. Hannover, March 1913.

The writer has investigated the inheritance of milk production in a registered herd of Dutch cows in East Prussia. The milk yield and pedigree of the animals has been registered since 1884. As the milk yield of a herd during 28 years (1884-1912) can be much affected by external circumstances, the average production of the herd for each year of this period was estimated; it amounted to 7799 lbs. in 1884 and 9957 in 1912. The milk yield of the herd was especially high in 1896 and 1907. In order to determine the cause of this increased production, the writer, in the first place, ascertained the influence in this direction exerted by the bulls which were most often used as sires. The following were determined: 1) average milk yield in particular years of all the daughters of each bull; 2) how this yield compared with the milk production of the other cows of the herd during the same years; 3) the average milk yield of the dams of cows sired by these bulls; 4) how the average yield of the daughters compares with that of the mothers.

On the basis of these investigations, the writer concludes that the increased yield during the period 1896-1906 is chiefly due to an improvement in the average quality of the herd, while the further average increase of 1907 to 1912 is primarily attributable to the better feeding and tending of the animals.

After the writer had investigated the development of the milk yielding property of the herd, and ascertained the quality of each single cow as a milk producer, he divided the cows into classes and investigated how the milk yield of the offspring compared with that of the mothers. The data, which are arranged in tables, show that there are great variations in the inheritance of the property of milk production. The offspring of the best mothers yielded, on an average, the most milk and those of the inferior mothers the least. The range of variation was, however, not so great among the daughters as among the mothers. First class cows produced both good and inferior offspring, and the opposite is true. The inheritance varied around a centre, which was somewhat higher in the daughters of superior mothers than in those of inferior cows. The magnitude of the variation was the same for all the classes. (1).

Peters then determined the milk production of the grandparents, and of the separate families of the herd. With regard to the families, he found that some produced relatively many good animals, while the descendants of others were usually inferior cows; in other families again, he observed unusually large variations in the performance of the offspring. As a rule, however, the offspring of good families were good milkers, and those of inferior families unsatisfactory. Inheritance varied in the case of mediocre families.

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(1) Cf. also "Cow Testing in the Breeding of Dairy Cattle", No. 1550, *B.* Nov. 1912, especially pp. 2478-2480. (*Ed.*).

The writer comes to the conclusion that it is not sufficient to estimate the absolute and relative yield of the cows, and upon these data to select the offspring of the *best individual* performers for further breeding, but it is necessary to select the *best families*, for amongst the descendants of these will be found the largest number of good milch cows.

713 – **The Latest Decisions of the Control Associations in the District of Malmöhus in Sweden and in Denmark.** — RICHARDSEN in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 4, pp. 160-162. Hannover, April 4, 1913.

Abstract from the Report of the work of the Malmöhus Control Associations for 1911-1912 and those in Denmark for 1910-1911. A summary and comparison of the results of the last 8 or 10 years.

PIGS

714 – **Comparative Feeding Experiments with Hominy and Barley for Pigs.** — KLEIN in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 7, pp. 143-145. Berlin, April 1, 1913.

These experiments were made by the writer in 1912 at the Proskau Dairy Institute for the purpose of determining in what measure the American hominy (a by-product of maize) could be used as a substitute for barley.

		Lot I	Lot II
		lbs.	lbs.
Initial weight of all the pigs		118 ¼	122 ½
Final » » » » »		569 ¼	589 ½
Gain in weight » » » »		451	467
» » » » » » » in 1 month		109 ½	122 ¼
» » » » » » » » 2 months		177	167 ¼
» » » » » » » » 3 months		164 ½	177 ½
Amount of food required to produce an increase of 1 lb. in live-weight		2.1	2.06
		£ s d	£ s d
Cost of food	skimmed milk	2 3 3	2 3 3
	barley	3 3 3	1 5 4
	hominy	— — —	1 14 0
Total cost of feeding		5 6 6	5 2 6
Cost per pound increase of live weight		2.3 *d*	2.2 *d*

Fourteen six-weeks-old pigs of the improved German breed were selected and divided into two lots, each containing 4 hogs and 3 sows. All the animals were given skimmed milk, crushed barley and a little powdered chalk (about 1/4 oz. per head per day). At the commencement of the experiment half of the barley was replaced by hominy for group II. As the pigs became older, the rations were increased in proportion to the gain in live-weight, and in lot II more of the barley was replaced by hominy; towards the end of the experiment they got nearly twice as much hominy as barley. The feed was given moist four times a day.

The experiment lasted from June 12 to September 3, and no bad effects were observed, but the pigs did not seem very keen on their food.

The animals were weighed singly and fasting at the beginning of each week and at the commencement and close of the experiment; the average of these results was taken. These data are given in the table on p. 931.

Although the experiment with hominy was satisfactory, the writer does not consider it advisable to replace barley by larger quantities of hominy, and still less to substitute the latter entirely for the former, as the appetite of the animals would be affected by the change.

715 – **Fattening of Pigs with the Automatic Feeder** (1). — DE LA BARRE Aufzucht und Mästung von 4 sechs Wochen alten Ferkeln am Futterautomaten. — *Tierzuchtnachrichten der Landwirtschaftskammer für die Provinz Brandenburg und Mitteilungen der Versuchsstation für landwirtschaftliche Fütterungsversuche zu Karstädt* (*Westprignitz*), Year 6, No. 2, pp. 15-17. Prenzlau, February 16, 1913.

Two sow pigs and two hogs were fed by means of the dry-feeding automatic apparatus from their fortieth day until they were fattened. At the beginning of the experiment, the dry food consisted of 2 parts crushed barley, 1 part wheat meal and 1/5 part fish meal freed from fat. Each pig received also daily for the first week about a quart of whole milk and 2 1/2 quarts of skimmed milk mixed with a little sifted crushed barley and fish meal, and for the following 10 days 3 1/2 quarts of separated milk. This first ration was intended as a preparation for pure dry feeding. Subsequently, the following substances were put into the automatic apparatus in addition to those above mentioned: " Fattinger's Körner blutfutter II ", crushed beans, ground maize, ground rye and potato flakes.

From the beginning of the fourth week up to the end of the experiment, the dry food was made as shown on the opposite page.

In addition to the dry feed the pigs also received comfrey (*Symphytum asperrimum*), cabbage and beet leaves, garden refuse, and sliced mangels. To encourage digestion, a small quantity of Teichel's digestive salt " Pekubus " was mixed with the food.

The pigs developed normally. One of them was sold to the butcher at the age of 22 weeks, while the other three were fat when they were 26

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(1) See the diagram and description of an automatic feeding apparatus in No. 372, below; references given there. (*Ed.*).

Week	Crushed barley	Wheat meal	Potato flakes	«Körner-blut-futter II»	Fish meal	Crushed maize	Crushed rye	Crushed beans
IV . . .	7	5	1	0.6	0.6	—	—	0,2
VIII. . .	5	5	1	0.5	0.5	0.3	0.3	—
XIV. . .	5	5	2	0.5	0.5	3	3	—
XVIII. . .	10	10	5	1	1	10	6	—

weeks and 3 days old. The results of the experiment may be summarized as follows :

Weight of pigs at beginning of experiment . . .	84.7 lbs.
,, ,, ,, ,, end ,, ,, . . .	839.3 ,,
Increase in weight	754.6 ,,

Average increase in weight per head, per day:

when 6-12 weeks old	16 3/4	oz.
,, 12-16 ,, ,, ...	22 1/4	,,
,, 16-20 ,, ,, ...	26	,,
,, 20-22 ,, ,, ...	26 1/2	,,
,, 22-26 1/2 ,, ,, ...	24 1/2	,,

	£	*s*	*d*
Total cost * of feeding.	10	14	10
Cost of food per 100 lbs. live weight	1	8	5

* Garden refuse and mangels, which were eaten in small quantities only, are not reckoned.

716 - **An Experiment in Pig Feeding and Fattening on Sugar Cake (Brand B.)** (1).
MANICARDI, C. in *L'industria lattiera e zootecnica*, Year 11, No. 6, pp. 86-87. Reggio Emilia, March 15, 1913.

This experiment was made on 40 pigs, divided into two lots of 20 each; of which one was given farinaceous food as is customany in the district, while the other was fed sugar cakes (Brand B). supplied by the Italian Distilleries of Milan. The two lots also received whey and bran.

The pigs ate the cake with avidity, and when the animals were slaughtered, the flesh presented its usual appearance, while the fattening results were superior to those obtained with farinaceous food ; further, the sugar cake proved to be the more economical feed.

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(1) This cake is composed of: grape pomace meal, dried distillation residues and molasses. For experiments in feeding milch cows with this product, See No. 1551, *B.* Nov. 1912. *(Ed.)*

717 – **Fattening Hogs in Nebraska** (1) – SNYDER, W. P. and BURNETT, E. A. *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Article II (No. 124), pp. 71. Lincoln, Nebraska, June 15. 1912.

The results of previous experiments are summarized and full details are given of the recent experiments.

The bulletin is divided into two parts; the first deals with the use of alfalfa hay with corn for fattening hogs; the second is devoted to a comparison of corn, corn and alfalfa, with supplementary foods for fattening hogs.

The conclusions are the same as those published in the preceding Bulletin, No. 123.

POULTRY

718 – **A Comparison between Natural and Artificial Incubation.** — BRECHEMIN, L. *in Giornale degli Allevatori*, Year IX, No. 3, pp. 21-24. Catania, February 15, 1913.

In describing the results of some comparative experiments in natural and artificial incubation, the writer first states that no comparison can be made in the period from December to the end of February, because it is then very difficult to find broody hens. Turkey hens can indeed be obtained, but their use entails great inconvenience, for as their time of incubation is longer than of fowls, they crush some of the chickens the first day of hatching unless these are removed on the nineteenth day, when after having been placed for some minutes in tepid water, they can be hatched in an incubator.

The experiments were made during March, April and May. Three turkey hens and three fowls were used on the one hand, 100 eggs being entrusted to them, while the parallel experiment was carried out in an incubator with a warm water tank, the heat being maintained by means of a small lamp.

This incubator was provided with a regulator; the egg chamber was deep and the bottom was concave and covered with wire gauze. A hundred eggs were placed in the incubator every month.

After incubation, the eggs were examined by being held up to the light and the clear and infertile ones removed. The incubation results were as follows:

Natural incubation: 242 fertile eggs produced 158 chicks
Artificial incubation: 243 fertile eggs produced 209 chicks

Thus the results were entirely in favour of artificial incubation. In order to prove this fact thoroughly, a comparison was instituted between natural and artificial rearing.

The food was the same in the case of all the chickens; it consisted for the first three days of a mash of hard-boiled eggs, and subsequently of soaked bread, boiled potatoes, boiled rice, maize cake and meat meal for the mash, with crushed millet, oats, and buck wheat. The chickens entrusted to the hens and turkeys were kept in open houses and allowed the run of a grass park of about a quarter of an acre in extent. The artificially reared chickens were kept on a space only two-thirds of the size and housed in a large shed glazed in front. The brooder was of very simple construction, with a zinc plate and petroleum lamp and was provided with a small adjoining run enclosed with wire-netting and glazed.

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(1) See No. 1658, *B.* Dec. 1912. (*Ed.*)

Three months after hatching the results were as follows. Out of 158 chicks reared naturally, 75 were alive, while 194 of the 209 artificially-reared birds had survived. The loss, which exceeded 50 per cent. in the case of naturally reared chickens, (being larger with turkey foster-mothers than with hens), was only 10 per cent in that of the artificially reared chickens.

The loss is however, much less if the fowls are kept in coops or in closed houses.

In conclusion, the writer states that, though natural incubation and rearing are perhaps to be recommended for small poultry breeders, and for raising breeding birds, the resulting chickens being more robust, artificial methods are preferable in the case of large poultry farms.

719 – **Experimental Work in Artificial Incubation.** — BROWN, W. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 11, pp. 909-914. London, February 1913.

The writer mentions the fact that the results obtained by artificial incubation are not equal to those obtained by natural means. He gives, in this connection, an account of experiments which R. J. Terry, poultry expert to the Tasmanian Government, has been carrying out for the past ten years. Mr. Terry suggests that eggs receive too much air in modern incubators, and draws attention to the fact that the irregular broken ring of blood, which sometimes occurs before the sixth day instead of the "spider" seen with a living embryo, is more common in eggs from incubators, which have excess of ventilation than in others. Fewer chickens are hatched in well-ventilated incubators.

720 – **The Württemberg Apicultural Stations for the Production of Selected Queen Bees.** — *Die Bienenpflege*, Year XXXV, No 4, pp. 73-77. Weinsberg, April 1913.

BEES

A report of the work of the Stations for the production of selected queen bees of the German breed.

721 – **Automatic Fishing Apparatus.** — *Bollettino della Società lombarda per la pesca e l'acquicoltura*, Year VI, No. 3, pp. 37-40. Milan, March 1, 1913.

FISH

This article deals with a new system of fishing effected by an apparatus devised by Cav. Giuseppe Pino and already patented.

The automatic fisher consists of a framework of pieces of wood fastened together by means of coupling boxes in a form suitable for making the bottom of the apparatus. Upon this are fixed 16 very strong poles, which are kept vertical to the framework by means of three stays to each pole and by wire ropes. At the summit of these poles are affixed 9 bags of netting corresponding to the 9 squares formed by the framework. These bags, which are 22 fect deep, are in the shape of a funnel and have a wooden sliding valve at the bottom, dividing the bag into a larger and smaller part, the latter serves to catch the fish and is capable of being emptied once, or oftener during the day.

In the centre of the framework, below the central bag, is situated the receptacle for the compressed air, which causes the ascent and descent of the apparatus, and is kept in place by 16 metal cords affixed to the framework. The mechanism which works the apparatus consists of a motor feeder, and a compressor of sufficient power, used to pump the air into the accumulator. The latter, which has an indiarubber tube fitted with a tap, is attached to the raising receptacle of the apparatus.

The apparatus descends on closing the tap which admits the air, and on opening the one which allows the air to escape. The special arrangement for the vertical descent and oblique ascent of the apparatus consists of small wooden regulators placed on the principal base framework.

The apparatus can be constructed on a small or large scale, and fishing can be done at great or small depths. For fishing with this apparatus, a motor boat of about 10 H. P. is necessary ; part of this force is used for compressing the air. In order to raise the automatic fisher, when once it has descended to the bottom, it suffices to subject the air in the receptacle for ascending to a pressure exceeding that of the water at this depth. The apparatus, while ascending, can be dragged by the boat (by means of the rope by which it is attached to the latter) in such a way that it can assume at will a vertical or oblique position.

The fisher is so balanced that, in spite of its weight of about 10 tons and its surface of 1100 sq. yds. it floats perfectly, raising the bags of the nets above the water and allowing the boats to pass between these to see whether any fish have been caught, and remove the spoils, if the nets are full.

The apparatus was successfully tested in the Lake of Zurich and the inventor is making a second of 840 sq. yds. in size, with only four bags, which he intends trying in the Mediterranean.

The cost of the automatic fisher is about £320 and together with the motor boat, the whole price would amount to £800.

722 – **Actinomycosis of Prussian Carp.** — PLEHN, MARIANNE in *Allgemeine Fischerei Zeitung*, Year 38, No. 9, pp. 222-224. Munich, May 1, 1913.

The writer describes in the text, and with the help of illustrations, a new chronic fish disease, actinomycosis, due to a fungus. The latter attacks Prussian carp (*Carassius Carassius*), producing abscesses in the kidneys or other internal organs. The external symptoms of the disease are the sluggish movements and the swelling of the body of the fish.

OTHER LIVE STOCK

723 – **The Effect of X-Rays upon the Development of the Ovary of the Rabbit,** — REGAUD and LACASSAGNE in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 11, pp. 601-604. Paris, March 21, 1913.

The writers tried the effect of the X-rays upon several rabbits' ovaries and found, upon examining the latter some hours later, that the follicle cells had been injured. The stronger the X-rays used, the more the follicle cells were harmed. A fortnight after the ovaries had been exposed to the rays, all the follicles, with the exception of some small primordial cells invisible to the naked eye, had disappeared. With the disappearance of the follicles, the activity and formation of the interstitial glands of the follicle capsules decreased. About 3 months after the X-ray treatment, the writers observed a new formation of the glands on the surface of the ovary, but they were much less active than before. The follicle cells which remained unharmed gradually grew to normal and abnormal Graafian follicles within 6 months. The former gave rise to ova, which were capable of fertilization and produced normal offspring. The writer observed no fresh formation of ova, nor any reappearance of follicles which had disappeared on exposure to the X-rays.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

724 - **New Cultivator.** — *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 26, p. 310. Vienna, March 29, 1913.

This new cultivator consists of a three-wheeled carriage, supporting an adjustable frame containing tines similar to those carried by extirpators. The depth of the tines can be adjusted up to 7 ¼ inches. Behind these tines there are four adjustable disks intended to break up the soil loosened by the tines. If these disks are not suitable to some kinds of soil they can be replaced by a toothed harrow. As this implement works a strip 16 feet wide at a time, and can be quickly drawn by the smallest steam ploughing engine, the amount of work it can do is very considerable. It is especially adapted for paring a field after the harvest and for loosening and preparing for sowing fields that have been deeply ploughed before the winter, or that have borne potatoes or beets.

725 - **Trials of Mechanical Ploughing Tackle at Sétif and Maison-Carrée (Algeria).** MARMU, M. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, First Half-year, No. 1, Vol. 119, pp. 147-157. Paris, January 1913.

These trials lasted from May 26 to June 12, 1912, and were held partly at Sétif and partly at Maison-Carrée. The following five machines were sent to be tested.

The C. I. M. A. tractor (Titan).
The Avery tractor.
Landwin's agricultural motor.
The tractor of the Case Co. (a French firm).
J. and H. Maclaren's tractor.

The article contains tables giving the dimensions and characteristics of the machines, as well as the amount of force required for the work done, the time required, the depth and width of the ploughing and the amount of fuel used.

These trials did not give the expected results, for the nature of the soil to be ploughed had not been taken into account in the construction of the machines. The commission are of opinion that tractors with explosion motors cannot be introduced into North Africa until the taxes on motor spirit and petrol are reduced.

726 – **The Use of Mechanical Power in Agriculture** (1). — SCHWANECKE, H. K. in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Parts 7 and 8, pp. 242-272 and 286-306. Stuttgart, April 1 and 15, 1913.

After some preliminary remarks on the most important power-driven agricultural machines, the writer compares the various systems of mechanical ploughing from the points of view which have the greatest interest for farmers, such as cost of installation, weight of the principal parts, performance, number of hands and team required, saving of teams and of working expenses, utilisation of the motor for other objects.

In the second part of the paper he treats of transport machines and especially of field railways and motor waggons.

727 – **Electricity and Agriculture.** — KOPPEL, R. in *Monatshefte für Landwirtschaft*, Year VI, Part 4, pp. 97-110. Vienna, April 1913.

The writer gives a very instructive review of the present state of the application of electricity to agriculture. After introductory remarks on the cost of electric motor power and on the approximate amount of power required by the most commonly used agricultural machines (threshing machines, electric milkers, cereal cleaners, scutching and shearing machines), he discusses electric incubators and brooders.

The writer then considers tilling by electricity and its economy, and gives an example of the total cost of such an installation.

After a brief mention of recent experiments on radio-activity, the paper concludes with remarks on the production of electricity.

728 – **Agricultural Machines at the Machine Exhibition in Paris in 1913.** — COUPAN, G. in *La Vie Agricole et Rurale*, Year 2, No. 18, pp. 485-493. Paris, April 5, 1913.

The writer gives a detailed description and diagrams of some of these machines for working the ground, which are distinguished by innovations and improvements. He mentions Massignon's subsoil plough, Bajac's draining plough, Letroteurs' balance plough and also Bajac's balance ploughs. Machines for mechanical ploughing are also described, such as the steam ploughing engine of the "Société Française de matériel agricole et industriel", the Avery, Fowler and Doizy tractors, the Stock motor plough and others.

729 – **Motor Power Cultivation with only one Winding Drum.** — RINGELMANN, M. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, 1st Half-Year, Vol 119, No. 2, pp. 352-357. Paris, February 1913.

The writer describes and illustrates the machines of E. Kuntz and of A. Bajac which were exhibited at machine shows in Paris and explains their working.

730 – **The Mesmay Tractor.** — DE CONDÉ, F. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, First Half-year, Vol. 119, No. 2, pp. 350-352. Paris, February 1913.

A description, with figures, of the Mesmay tractor, together with an account of its performance at the Bourges trials.

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(1) See No. 400, *B*. April 1913. (*Ed.*)

731 – New Patents for Agricultural Machines and Implements.

53 969,45*a* (Austria). Motor plough.

58 976,45*a* (Austria). Motor plough, in which the revolving driving pawl moves in a fixed guide.

59 532, 45 *a* (Austria). Outfit for double engine system of ploughing.

59 539, 45 *a* (Austria). Motor plough with vertically adjustable steering wheel, provided with a coulter flange, running on the unploughed land.

59 537, 45 *a* (Austria). Apparatus for tilling the soil, with revolving disks mounted obliquely on a shaft.

59 538, 45 *a* (Austria). Turn-wrest plough.

59 331,2 *a* (Switzerland). Automatic device for turning and fixing the working parts of multiple ploughs.

450 965 (France). Fore-carriage for ploughs, on two or three wheels, with the beam below the axle of the side wheels.

451 372 (France). Implements for motor ploughs.

259 163, 45 *a* (Germany). Apparatus running on rails, especially turn-wrest plough for market gardens.

259 165, 45 *a* (Germany). Subsoil loosener for ploughs.

259 083, 45 *a* (Germany). Hoeing outfit for tilling machines, with hoes fastened by means of intermediate parts to separate disks.

259 085, 45 *a* (Germany). Apparatus for tilling the soil with several implements mounted on a revolving axle and working successively.

259 260, 45 *a* (Germany). Motor plough with driving wheel running in the furrow behind the plough shares.

2057 (England). Self-propelled tractor.

16 160 (England). Power-driven tillage machine.

4930 (England). Motor plough.

1 056 532 (United States). Plough lift for gang ploughs.

1 056 531 (United States). Plough lift for gang ploughs.

58 970, 45 *a* (Austria). Spring-tooth cultivator, with teeth working in the wheel ruts.

59 587, 2 *a*) (Switzerland). Cylinder for field and pasture rollers.

59 332, 2 *a* (Switzerland). Ribbed roller clod-crusher.

1056 514 (United States). Rotary harrow.

450 871 (France). Apparatus for cleaning rotary harrows.

451 393 (France). Spring tine cultivator.

58 975, 45 *a* (Austria). Manure coverer for ploughs, which by a swinging movement removes the manure from the coulter and share-point.

59 269,45 *a* (Austria). Manure distributor for machine dibbles.

59 271,45 *a* (Austria). Manure distributor.

1056 577 (United States). Guano distributor.

59 273,45 *a* (Austria). Potato planter.

259 261, 45 *b* (Germany). Multiple-furrow potato-planter, with chain of cups under hopper.

1898 (England). Drill for turnip and other seeds.

58 967, 45 *b* (Austria). Grass mower with reaping attachment.

58 973, 45 *b* (Austria). Machine for binding straw, hay, etc.

59 400, 45 *b* (Austria). Apparatus for lowering the sheaves, in reapers.

59 792,2 *c* (Switzerland). Cutting apparatus for mowers and reapers.

451 537 (France). Reaper.

2854 (England). Mowing machine.

1056 122 (United States). Mower attachment.

259 386, 45 *c* (Germany). Mower with vertically adjustable finger disk and horizontally revolving knives and carrier arms.

59 412, 45 *b* (Austria). Potato lifter, hay tedder or swath turner with throw wheel, the teeth of which are driven by planet gearing with centre wheel mounted on elastic supports.

59 474, 45 *b* (Austria). Potato lifter with apparatus for depositing crop.

59 558, 2 *c* (Switzerland). Drum hay tedder with excentric gearing for the tine shafts.

451 673 (France). Hay rake.

1 056 665 (United States). Grain harvester.

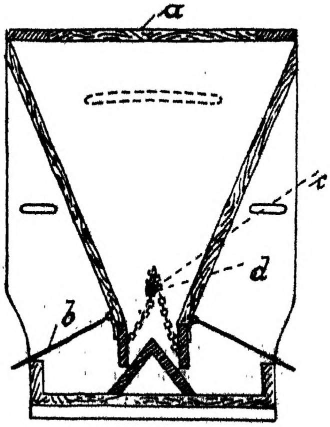
59 266, 45 *b* (Austria). Apparatus for cleaning seeds and the like, with endless screens placed over each other.

59 535, 45 *b* (Austria). Straw elevator.

BUILDING-CONSTRUCTION

732 - **Helm's Automatic Feeder** (1). — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 33, p. 218. Berlin, March 19, 1913.

With the apparatus shown in the annexed figure there is no danger that the pigs can soil their food. The feeding troughs are closed on both sides by iron covers (*b*) which have to be raised by the pigs when they take their food; (*a*) is a moveable cover; (*c*) the adjusting lever, and (*d*) the shaft with chains for moving the boards. This automatic feeder is refilled every five days with the required amount of food.



733 - **An Apparatus for Drying Cotton.** — *The Agricultural News*, Vol. XI, No. 278 p. 403. Barbados, December 21, 1912.

The accompanying photographs (1) show a new apparatus for cotton drying, which differs in its system from those hitherto used for the purpose in St. Vincent by its simplicity and the ease by which drying operations can be effected even during wet weather. The system was devised by Mr. C. O. Hazell, of St. Vincent and comprises a drying rack on wheels. The cars can be moved easily; their length is 13 ft., their width 3 ft. 7 in., and their height 8 ft. 4 in. They hold seven trays each 5 inches deep running the whole

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(1) For experiments in feeding with automatic distributors see No. 1606, *B*. Dec. 1912; No. 283, *B*. March 1913; and No. 715 above. (*Ed.*).

(1) These were kindly placed at our disposal by Mr. W. N. Sands. (*Ed.*).

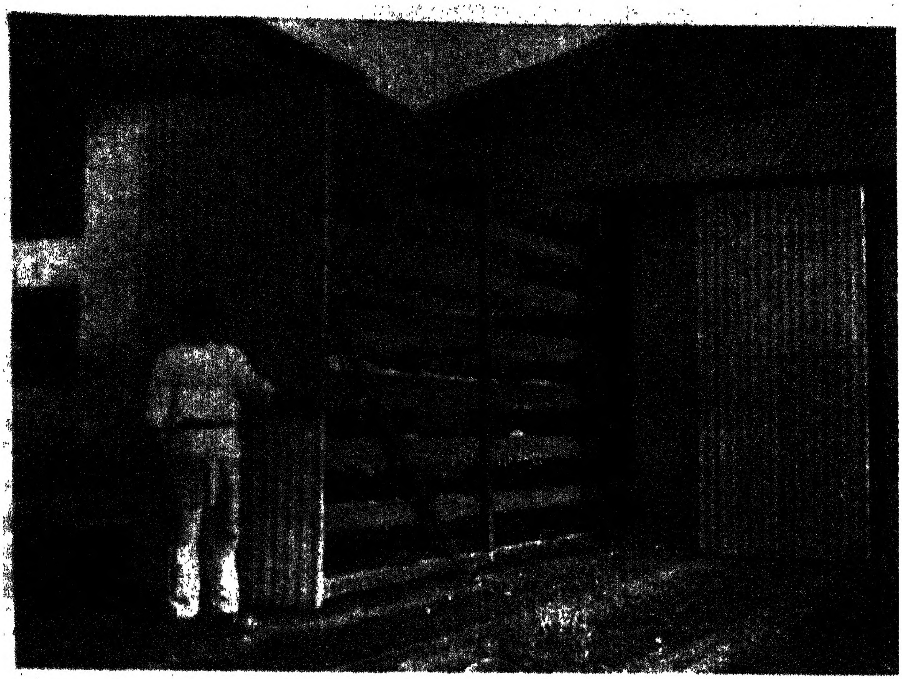

Fig. 1

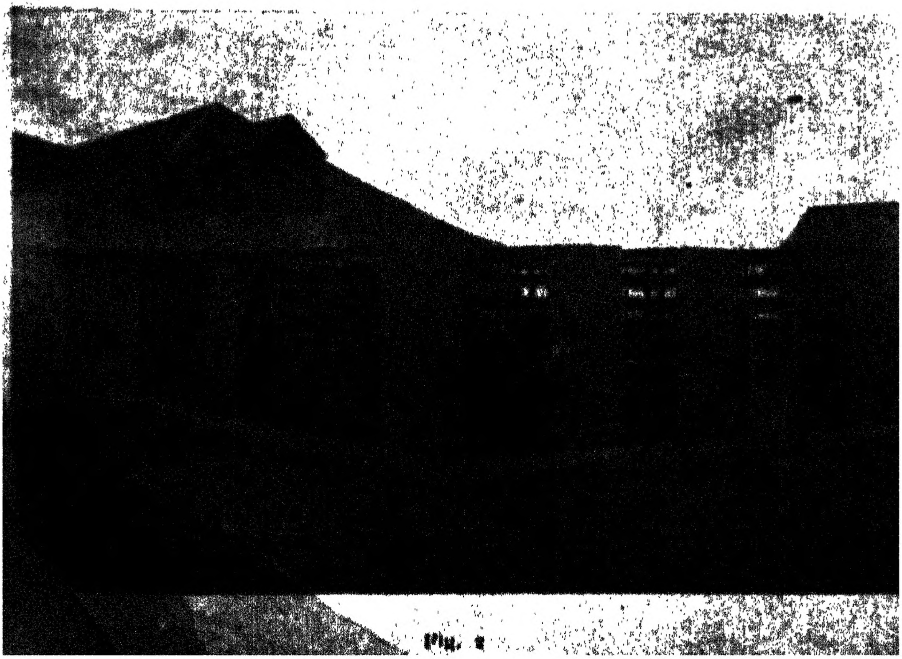

Fig. 2

length and width of the car; the bottoms of the tray are made of ¼ inch galvanized wire netting, so that the air passes easily through the cotton. As the cars run on rails both inside and outside of the drying house, moving them requires little labour. When the cars are inside the house, the cotton is protected form the weather by the device of covering the outside end of each leading car with galvanized iron sheeting, which exactly fits the exit space in the wall when the car is pushed home.

Fig. 1. shows the car when drawn out, while fig. 2 gives the whole apparatus.

RURAL ECONOMICS.

RURAL ECONOMICS

734 - **The Installation and Accounts of a Large English Dairy Farm.** — The Production of Clean Milk on Two Large Dairy Farms. — *The Journal of the Board of Agriculture*, Vol. 19, No. 11, pp. 923-928. London, February, 1913.

The Kelmscott herd of pure-bred dairy Short-horns is said to be the largest in the country, and the system on which it is kept is admirable. The owners farm an area of 2 144 acres in contiguous holdings in Oxfordshire, Gloucestershire and Wiltshire. Over 200 cows are kept, and the milk is sent daily to London. In 1909, all cows and heifers in milk were tested for tuberculosis, and since that year the stock has been tested annually. So far only eight animals have reacted and six of these were stock not bred at Kelmscott. No cow that reacts is allowed to contribute to the milk supply. In order to ensure the purity of the milk great care is taken that the hands and clothes of the milkers should be scrupulously clean. During most of the year, the cows are groomed before milking and the udders washed. The tails, udders and hind quarters are kept clipped ; and the cowhouses are clean and well-ventilated.

The milk is not pasteurized, but simply cooled to 58° F. Although many milking machines are in use on the surrounding farms, they have not been adopted at Kelmscott, where all the milking is done by hand.

The wages are relatively high ; Messrs. Hobbs pay a day labourer from Oct. 1 to Sept. 30, 15*s* 4*d* without cottage) the average weekly wages of an Oxfordshire labourer are 13s), or with harvest money, cottage (if provided), extras, etc., 16*s* 4*d*; an under-carter's wages at Kelmscott are 17*s* 0 ½ *d*, including lodging at 1*s* per week, a head-shepherd's 26*s* 2*d* reckoning 1*s* 6*d* a week for cottage and garden. The men's cottages are of an exceptionally good class ; the total number of the staff is 102.

The rations fed to the cows vary greatly according to the value of the different feeding stuffs but the following tables indicate average feed :

Winter.

3 lbs. dried grains,
3 lbs. mixed bean meal and oat meal,
3 lbs. cotton, soya bean and dairy cake mixed.
9 lbs. per day for thirty weeks.

Summer.

2 lbs. cotton cake.
1 lbs. soya bean cake,
1 lbs. dairy cake,
4 lbs. per day so long as the animal gives 2 gals. daily.

The average milk yield per cow for the three years ending September 30, 1911, was for 134 cows 6015 lbs., this being the lowest average for many years owing to the summer drought. The average yield per cow for 1910 was 6 330 lbs, and for 1909, 6500 lbs. The average yield of an average farm cow in Great Britain is perhaps 4 500 lbs.

The average yearly expenditure of recent years has been £ 13 096 6s 10*d*. Messrs. Hobbs have made the following estimate of the cost of a herd of 40 dairy cows kept on their system.

Estimated Cost of Herd of 40 Dairy Cows.

Food.		£	s	d
Grazing, 1 ¼ acres per cow = 50 acres at 30 *s*		75	0	0
Rates at 2/6 in £		9	7	6
After feed, 1 ¼ acres pes cow = 50 acres at 6*s*.		15	0	0
1 ¼ tons hay = 50 tons at 40 *s*		100	0	0
56 ibs. mangolds per day per cow for 210 days = 5 ¼ tons × 40 = 210 tons at 5 *s*		52	10	0
6 *d* per cow per day feeding stuffs, 210 days	£5 5*s* o*d*			
2 ½ » » » 90 »	£0 18*s* 9*d*			
	£6 3*s* 9*d* × 40 =	247	10	0
Attendance.				
Thirty weeks, winter		99	0	0
Fourteen weeks, summer		29	8	0
Milk cart, horse and driver.		40	0	0
Depreciation in value of cow per year, £ 1		40	0	0
Losses in death, abortion and veterinary expenses. . . .		40	0	0
Expense of bull 5*s* per cow		10	0	0
Up keep of dairy utensils 5*s*		10	0	0
Total . . . £		767	15	6
Per cow . . . £		19	3	10
Produce per cow: 600 gall. milk at 8 *d*		20	0	0
Value of calf		2	10	0
£		22	10	0
£		19	3	10
Balance (gross profit) . . . £		3	6	2
To Railway Company: carriage of milk, 600 gallons at 1*d* per gallon		2	10	0
Net profit per cow . . .		0	16	2

735 – **"The Evesham Custom."** — *The Gardener's Chronicle*, Vol. LIII, No. 1367, pp. 156-157. London, March 8, 1913.

More than 10 000 acres of land in the neighbourhood of Evesham are occupied by market gardens, which are, with few exceptions, leased to tenants. The great extension and the flourishing condition of this intensive cultivation are due, in addition to other circumstances, to the system of tenure obtaining in that district. This system, entitled the Evesham Custom, allows the tenant to pass his lease on to a third party, on payment of a sum as compensation for improvements to the ground and the expenses incurred in planting; the new tenant, with the consent of the owner, takes over the land on the same conditions as the former tenant.

The tenant is thus able to give up, at any season of the year, and whenever he wishes, the whole, or a portion, of his land to another tenant and incurs no risk by so doing.

He is also empowered to hand over part of the market garden to his grown-up sons, as soon as they are capable of managing the business.

Owing to the short period of time which elapses between the giving of the notice to quit and the incoming of the new tenant, it is impossible for the old tenant to exhaust the land and thus decrease its value. Further, even if he had a longer time at his disposal, it would be to his own interest to keep the market garden in the best possible condition, for the compensation which he receives at the close of his tenancy is based upon the condition of the land at that time.

The owner of the land is thus relieved of the necessity of compensating the outgoing tenant for improvements or planting; and is saved the cost and frequent litigation entailed by the often difficult matter of valuation. This system also greatly diminishes the risk of not finding a new tenant within a given time.

The writer gives a brief summary of the provisions of the "Market Gardeners' Compensation Acts".

736 – **Reorganisation of Agricultural Land Tenure in Russia.** — HITIER, H. Progrès de l'Agriculture russe. — *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 1, pp. 133-146. Paris, January 1913.

The Imperial Decree of February 19, 1861, had given the rural population as perpetual holding 294 150 000 acres of land; of this quantity 242 875 000 acres was the property of the communes, and 51 275 000 acres consisted of family hereditary holdings. In no case were the grants of land made to individual farmers, but always to the commune, which had then to distribute the land among the various families.

In this distribution the land was classified according to its quality and to its distance from the village, and from each class a plot was given to each villager to cultivate. At every new redistribution of the land rendered necessary by the growth of population, the number of classes was increased; this naturally gave rise to an ever increasing subdivision of the land with all its attendant evils.

On March 30, 1905, the Czar of Russia appointed a special commission for the object of discussing and proposing measures intended to convert the collective property of the communes into private property of the peasants. An Imperial Decree of November 3, 1905 exonerated the peasants from the payment of arrears after January 1, 1907, for the purchase of land.

The same decree authorised the Peasant's Bank founded in 1882 to advance peasants up to 90 per cent. of the value of their properties at an amortization interest of 4 ½ per cent. for 55 ½ years. In August 1906 this Bank was entrusted with the task of selling about 5 000 000 acres of crown lands to the peasants. A further decree of October 5, 1908, permitted peasants to possess land in different communes. Lastly the law of June 14, 1910 recognized the right of every peasant to become proprietor of his share of the communal property, and every commune obtained the right of converting the whole of its property into private properties.

In order to carry out in practice the new organization of landed property, the Central Committee for Agricultural Organisation was instituted, to train the necessary local authorities and to guide them in their work. These local authorities were appointed by Decree of March 4, 1906 under the name of Agricultural Commissions, in the various governments and districts. They were composed of Government officials and of representatives of the *Zemstvos*, the nobility and the peasantry. At present upwards of 6000 persons are working on the commissions in 47 governments. The surveyors engaged in the division of lands number 2730, with 2722 assistant surveyors, Between 1907 and 1911, 90690 communes sent in to the agricultural commission their request for the reorganization of the conditions of land tenure, and the surveys of 29 080 000 acres in 30431 communes have been made.

In the reorganisation of the landed property a distinction has to be made between the individual and the collective agricultural reorganisation. The former deals with the total abolition of collective ownership and its transformation into private property, uniting the several plots belonging to one owner; the latter proposes only to diminish somewhat the evils arising from a too minute subdivision of colletive property by creating new hamlets on outlying lands and by dividing the communes consisting of several villages into several independent communes. Since 1907 the number of small independent landowness has increased by 654 550. For the reorganisation of collective properties, which is only a transitory step towards the creation of private property, the plans referring to 7 450 314 acres of land have been approved by the inhabitants of the communes concerned.

Since 1906 the agricultural commissions have rented out 12 229 279 acres of State lands as small farms, and sold 887 851 acres to 57 293 peasants. The Peasant's Bank has bought, through the agency of the Commission, 13 981 544 acres of land from the large landowners with the object of selling them again as small farms. In order to facilitate the purchase of such farms by the peasants, the State grants them loans up to 150 rubles (£15 17*s* 6*d*), repayable in 10 years without interest, and subsidies up to 100 rubles (£10 11*s* 8*d*). Up to January 1, 1912, the Commission had granted the peasantry 147 670 such loans, amounting to £1 423 659, and 32 100 subsidies amounting to £91 498.

737 - Loss of Area due to Setting out Roads and Ditches in the Rearrangement of Properties.

— KESSLER in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 14, No. 16, pp. 284-286; No. 17, pp. 297-299; No. 18, pp. 315-316. Bonn, April and May 1913.

After a short review of the origin of the parcelling of fields and of the consequent servitude called in Germany "Flurzwang" (1) on the object and importance of the rearrangement of fields and the creation of a new network of roads, the writer combats the opinion that through the making of new roads and ditches too much land would be lost for agricultural purposes. He calculates, on the basis of the plans for the rearrangement of properties in the districts of Trefenbach, Kraftsolms, Ebersgöns and Hörnsheim, the amount of land which the setting out of new roads and ditches would take from the land at present utilized.

In this calculation he assumes that the injury caused by the excessive division of the fields is equivalent to the loss of a strip 18 inches wide for every plot of arable land and to one 10 inches wide for every plot of meadow; this loss is caused by the boundary furrow not being utilized, by the lower yield of the boundaries owing to imperfect manuring and to stagnation of water, and by the area occupied by the temporary roads. Considering the advantages of the new plans (Establishment of boundary stones, straight boundary furrows, careful and uniform manuring and tilling, abolition of temporary roads), the breadth of the boundary furrow of the new arable fields and of the meadows is reduced by 2 inches.

The plots of large proprietors or of associations, which, on account of their various sizes, would interfere with the formation of a just average, have been omitted from the calculation. The writer, however, includes in it the area required for the drainage and smaller irrigation ditches, notwithstanding the fact that the value of these areas is abundantly recouped by the adjoining meadow plots owing to the improvement due to the making of the ditches (See table).

The table shows that the area required for the new roads and ditches is almost exclusively supplied by the unutilized old boundaries. The three districts of Tiefenbach, Kraftsolms and Ebersgöns are situated in a very uneven region, and require a close network of roads that occupy a good deal of space, while Hörnsheim lies on flat land; consequently results are more favourable here than in the other districts.

Naturally the result is always much influenced by the greater or less subdivision of the fields, or in other words by the greater or less extent of rearrangement that has to be done. In view of further subdivision among co-heirs, the larger plans were divided in this rearrangement into smaller ones not exceeding an average of half an acre in extent; and as a basis

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(1) "Flurzwang" is that servitude which, owing to the division of properties, obliges all owners to cultivate the same crops as their neighbours.

		Tiefenbach
Number of plots before the rearrangement		7 746
Total area of these plots		904.4 acres
Area occupied by the old roads and ditches		39 acres
Area occupied by the new roads and ditches		105.3 acres
Excess of area required by the new roads and ditches		66.2 acres
Above excess in percentage of total area		7.3 %
Number and area of plots belonging to large proprietors, associations, etc.		646—194.7 acres
Area occupied by roads and ditches in above plots		14.3 acres
Area remaining for the other plots		51.9 acres
Number and area of old cultivated plots, not including above plots		4 930—555.1 acres
Average area of plots		0.114 acre
Average length		295.2 ft.
Average breadth		16.4 ft.
Number and area of old meadow plots not including above plots		2 170—143.3 acres
Average area of plots		0.067 acre
Average length		131.2 ft.
Average breadth		22.0 ft.
Unutilized area	arable land	(295.2 ft. + 16.4 ft.) × 17.7 in. × 4 930 = 52.1 acres
	meadow land	(131.2 ft. + 22 ft.) × 9.8 in. × 2 170 = 6.2 acres
	total	52.1 + 6.2 = 58.3 acres
Number of new arable plots		1 080
Average length of new arable plots (1)		360.8 ft.
Number of new meadow plots		370
Average length of new meadow plots (1)		328 ft.
Unutilized area	arable land	360.8 ft. × 15.7 in. × 1 080 = 11.86 ac.
	meadow land	328 ft. × 7.9 in. × 370 = 1.83 ac.
	total	11.86 + 1.83 = 13.69 acres
Of the old unutilized area there remains thus for roads and ditches		44.6 acres
Extent still required		7.3 acres
Percentage of area subject to contribution		1.05 %

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(1) In the new plots there is no boundary strip left against the roads.

Kraftsolms	Ebersgöns	Hörnsheim
7 800	7 100	6 256
983.5 acres	897 acres	1205 acres
36.8 acres	32.1 acres	33.4 acres
85.5 acres	88.9 acres	89.7 acres
70.9 acres	56.8 acres	56.3 acres
7.2 %	6.34 %	4.7 %
1 050—267.4 acres	260—168 acres	806—103.8 acres
19.3 acres	10.6 acres	4.94 acres
51.7 acres	46.2 acres	51.4 acres
4 440—538.7 acres	5 100—543.6 acres	4 550—914.3 acres
0.121 acre	0.106 acre	0.203 acre
328 ft.	278.8 ft.	360.8 ft.
16.1 ft.	16.4 ft.	24.6 ft
2 310—143.3 acres	1 740—143.3 acres	900—131.20 acres
0.062 acre	0.082 acre	0.104 acre
98.8 ft.	196.8 ft.	190.8 ft.
20.3 ft.	18.0 ft.	22.9 ft.
(328 ft. + 16.4 ft) × 17.7 in. × 4 440 = 51.9 acres	(278.8 ft. + 16.4 ft.) × 17.7 in. × 5 100 = 51.03 acres	(360.8 ft. + 24.6 ft.) × 17.7 in. × 4 550 = 59.31 acres
(131.2 ft. + 19.7 ft.) × 9.8 in. × 2 310 = 6.42 acres	(196.8 ft. + 18 ft.) × 9.8 in. × 1 740 = 6.99 acres	(190.8 ft. + 22.9 ft.) × 9.8 in × 900 = 3.71 acres
51.9 + 6.4 = 58.3 acres	51.03 + 6.99 = 58.02	59.31 + 3.71 = 63.02 acres
820	1 210	1 140
393.6 ft.	393.6 ft.	426.4 ft.
350	480	280
262.4 ft.	295.2 ft.	328 ft.
393.6 ft × 15.7 in. × 820 = 9.74 ac.	393.6 ft. × 15.7 in. × 1 210 = 14.33 ac.	426.4 ft × 15.7 in. × 1 140 = 14.58 ac.
262.4 ft. × 7.9 in. × 350 = 1.38 ac.	295.2 ft. × 7.9 in. × 480 = 2.13 ac.	328 ft. × 7.9 in. × 280 = 1.38 ac.
9.74 + 1.38 = 11.12 acres	14.33 + 2.13 = 16.46 acres	14.58 + 1.38 = 15.96 acres
47.2 acres	41.56 acres	47.05 acres
4.45 acres	4.63 acres	4.35 acres
0.65 %	0.68 %	0.37 %

for the calculation of the area required for roads, instead of the number of large plots, the number of the smaller ones was taken. By this means the objection that owing to future divisions of property among inheritors further boundaries will become necessary and thus diminish the favourable results obtained, cannot be raised.

738 - **A Model Improvement with Rounding-up of Holdings in the Tyrol.** — ZAILER, VIKTOR in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 32, pp. 384 and 385. Vienna, April 19, 1913.

A description of the cultivation conditions of a fen before and after improvement and the rounding-up of the holdings. Cost of drainage and of laying down new pastures. Map of the district before and after the rearrangement.

739 - **The Share System in the Italian Province of Aquila (Abruzzi).** — CRISCI, POMPILIO in *L'Agricoltura Italiana*, Series 4, Year 9, Part 6, pp. 166-169. Pisa, March 31, 1913.

The writer deals with the Share System contracts obtaining in the province of Aquila: length of lease and terms of notice; the sharing of the fixed and circulating capital and of the produce between the lessor and the lessee, the obligations of the lessee and the grants made by the lessor.

740 - **A Joint Labour and Tariff Contract between the Proprietor and his Labourers.** ZESSNER, H. K. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 29, pp. 351-353. Vienna, April 9, 1913.

The importance of the joint contract and its suitability to the requirements of farm management. Example of such a contract, which deals chiefly with the following matters: relations between landowner and the labourer's representative, the management by a labourer's committee of the labourers' savingsbank and benefit club (tariff of fines), the division of the labourers into classes, the permanence of their posts, obligation to work, the fixing of the wages and their amount.

741 - **Cost of Harvesting in 1911 and 1912.** — GIRARD, HENRY in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 111, No. 4, pp. 553-557. Paris, December 1912.

A comparison between the cost of harvesting wheat and oats harvests in 1911 and 1912 on the Bertrandfosse estate at Plailly, France.

Final data (per acre):

	1911			1912		
	£	s	d	£	s	d
Cost of reaping by hand and binding	—	14	$8^{1}/_{2}$	—	13	6
Cost of machine reaping	—	9	2	—	9	7
Carting expenses	—	14	8	—	15	2
Average general expenses	1	5	1	1	5	3

742 - **The Cultivation of Small Holdings in the Department of Ardèche in France.** — HITIER in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, No. 1, pp. 90-113. Paris, January 1913.

A description of about 10 well-managed small holdings of from 5 to 20 acres in extent, situated on the rocky eastern slopes of the Cevennes. Chief industries practised: silkworm-rearing, cultivation of vines and fruit trees (peaches, plums, figs, cherries), and market gardening.

AGRICULTURAL INDUSTRIES.

743 - **New Method of Freeing Milk from Germs.** — LOBECK, O. in *Molkerei-Zeitung*, Year 23, No. 14, pp. 157-158. Berlin, April 5, 1913.

DAIRYING

The writer points out the disadvantages of pasteurizing and sterilizing milk and describes a new method of freeing the latter from micro-organisms. This consists in pouring the milk from the pails into a pressure chamber, where it is subjected by a pump to a pressure of 4 atmospheres, then heating it as a fine spray indirectly for some seconds in a sterilizer at a temperature of 73 to 75° C. (163 to 167° F.), and immediately cooling it. The advantage of this method over those hitherto employed consists in the fact that the pathogenic milk flora is thereby destroyed without the milk having undergone any change, as far as chemical tests show. It retains the properties of raw milk and can be used for cheese-making. Milk so treated keeps twice as long as fresh milk, and on coagulation there is but little difference in the taste.

744 - **The Manufacture of Butter for Storage.** — ROGERS, L. A., THOMPSON, S. C. and KEITHLEY, J. R. *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* No. 148, pp. 27. Washington, 1912.

The long annual period of low production of butter in the United States has made it necessary, in order to ensure a fairly uniform supply, to store large quantities during the short season when the production exceeds the demand, which is in the spring and early summer months. In May, June and the early part of July there is active buying for storage. This season is followed by a few months in which the supply and the demand are nearly equal, while in the winter there is a decided scarcity of fresh butter. Butter may be held in storage from May to April, a period of 11 months, although the average time is probably only 8 or 9 months. Under exceptional conditions, dealers may have kept butter over a year, but this is usually done at a heavy loss.

An insignificant quantity is kept in small towns in refrigerators, mainly by an an ice-salt system at 20°-25° F., but the bulk of storage butter is in the great trade centres in large warehouses at temperatures of 0° F. and below.

All butter changes slowly in storage, even at temperature as low as —10° F, the waxy texture of the fresh butter changing to a pasty consistency. This is not evident, however, except on very long storage, and is not a factor in commercial storage. The most common alteration is in the flavour, which sometimes becomes so objectionable as to materially lessen the market value of the product. The cause of this change has not been determined with any certainty, but it is not due to the temperature, as it occurs in butter kept at higher temperatures. The most common alteration is the occurence of the so-called "storage flavour"; this only appears in old butter. Fishy flavour may be found in butter originally of the highest quality and much detracts from its market value.

Though the exact cause of these flavours has not been discovered, certain factors which may influence or accelerate their development have been pointed out in previous publications of the Dairy Division. The importance of the acidity of the cream at the time of churning, and the possibility of making butter of superior keeping quality by limiting the acidity has been especially emphasized in the latter. It was observed in the examination of 259 samples of experimental butter of known acidity, that of 137 samples from cream having an acidity of below 0.3 per cent., only 2, *i. e.* 1.5 per cent., were marked fishy; while of 122 samples having an acidity of 0.3 per cent. or over, 60, or 49.20 per cent., were fishy.

The probable nature of the relation of acidity to change in flavour has been discussed in previous bulletins of the Washington Bureau of Animal Industry. It is evident that, to make butter of good keeping quality, any treatment that increases the chemical instability of the product should be avoided. Butter of good quality can be made from sweet pasteurized cream and the deteriorating influence of the acid is thus eliminated.

Advantage has been taken of this fact by the Navy Department of the United States, which has found it expedient for several years to procure and store a year's supply of butter during the period of heavy production. The butter was made from pasteurized sweet cream and packed in hermetically sealed tin cans under the supervision of, and according to specifications prepared by, the Dairy Division of the Department of Agriculture.

The Navy butter for 1909, 1910, and 1911 kept excellently and proved the efficiency of the methods used in making and packing it.

The scoring of samples of butter contained in three series of cans and preserved in a similar manner for 8 months in 1909, 1910, and 1911 was as follows:

TABLE I.

Year	Average original score	Average score after storing	Average points lost in storage
1909	94.92	90.90	4.02
1910	94.73	91.75	2.98
1911	94.75	92.37	2.38

One creamery was permitted, by special contract, to disregard the acidity and pasteurization requirements of the specifications and to increase the water content to 15.5 per cent. on a guarantee that the butter would score 90 after being held in storage for 8 months. This butter was made from unpasteurized cream and an acidity of about 0.56 per cent was developed; the methods of packing, shipping and storing were the same as at other creameries having contracts for Navy butter. On comparing this result with the results obtained by the creameries working under the prescribed precautions and taking one which represents medium conditions, we find a difference of only 0.49 points in the score at the time of packing, while after being held in storage the difference amounts to 5.08 in favour of the butter made from pasteurized sweet cream.

Other experiments were made in 1910 in three creameries in the vicinity of Owatonna, Minn., in order to demonstrate the feasibility of butter dealers having butter made expressly for storage. The three creameries adopted different methods: *A* made butter from unpasteurized ripened cream; *B* pasteurized the cream, added a starter and ripened the cream in the usual way; *C* pasteurized the cream, cooled it at once and used no starter. The results, which are given in the following table, show the latter method to have been the most satisfactory.

TABLE II.

Character of cream	Number of churnings	Average score of fresh butter	Storage temperature °F.	Number of tubs scored	Average score after storage
Raw ripened cream	18	92.33	0	18	87.33
			10	18	86.94
			20	12	86.33
Pasteurized ripened cream	30	93.35	0	30	91.20
			10	30	90.28
			20	17	88.47
Pasteurized unripened cream	(1) 17	92.94	0	18	92.36
			10	18	91.91
			20	12	91.41

(1) Not including one churning which was not scored before storage.

In 1911, a similar arrangement was made with the same company and butter was made for storage at two creameries, *D* and *E*. Thus three different systems were followed, and the results were always in favour of using sweet pasteurized cream.

TABLE III.

Character of Cream	Number of churnings	Average score of fresh butter	Storage temperature °F.	Number of tubs scored	Average score after storage
Raw ripened cream	21	93.55	0	21	91.86
			10	21	89.48
			20	8	89.88
Pasteurized ripened cream	23	93.52	0	23	91.74
			10	23	89.91
			20	11	89.64
Pasteurized unripened cream	19	94.61	0	19	94.18
			10	19	93.16
			20	8	92.88

The superior keeping quality of sweet cream butter is evident in its uniformity, the slight change from its original condition, and the almost complete absence of the usual cold-storage flavours. This butter was made under conditions which could be duplicated for any dealer requiring butter made expressly for storage.

With regard to the influence of temperature upon butter, it is clear that a low temperature retards the changes in storage butter. A certain stage of deterioration may be reched in three weeks at 32° F, or in three months at 0° F.

The results on various lots of butter show a small difference between butter stored at — 10° F and + 10° F, but a marked difference between butter stored at 10° and 32° F. In the work reported in the present paper, duplicate tubs were stored at 0°, 10° and 20° F. The results due to temperature are well seen in Table IV.

These results show that the deterioration in stored butter is in a general way directly proportional to the temperature of the store and that pasteurized sweet-cream butter keeps relatively well at all temperatures; even at 20° F the latter deteriorates comparatively little.

TABLE IV.

Kind of butter	Points lost after storage		
	Stored at 0° F.	Stored at 10° F.	Stored at 20° F.
Raw Cream butter — Creamery A	5.0	5.3	5.8
» » » — » D	1.7	4.1	3.3
» » » all samples	3.2	4.6	4.8
Pasteurized ripened cream — Creamery B	2.2	3.0	5.1
» » » — » E	1.7	3.6	4.0
» » » all samples	2.0	3.3	4.6
Pasteurized unripened cream — Creamery C	0.6	1.0	1.5
» » » — » D	0.4	1.0	1.6
» » » all samples	0.5	1.0	1.6

745 - **The New Warm-Chamber Method of Making "Grana" Cheese** (1). —

OLIVA, A. in *Il Caseificio Moderno*, Year 6, No. 6, p. 85. Piacenza, March 15, 1913

During the last few years, the best-known investigators of the problems relating to cheese-making (Spallanzani, Gorini and Fascetti) have been trying to solve an important question in the manufacture of "Grana" cheese, namely to find a method of preventing the curd swelling without the loss of its characteristic appearance and flavour. The idea followed was to regulate the fermentation taking place during ripening; to this end the selected ferments of Professors Gorini and Fascetti have come into use and into the trade. These ferments, if used according to the instructions given by their preparers, have the property of hindering the development of the injurious ferments which affect the milk before and during the making of the cheese.

The new method has been proposed by Prof. Samarani of the Royal Cheese-Making Experiment Station at Lodi; it consists in promoting the development of selected ferments through the action of a warm chamber, thus giving them an absolute predominace in the fermentation process.

The method is practised as follows:

1) The filtered milk is cooled in a refrigerator to a temperature below 18° C. (64 ½° F.), when it is placed in metal basins to let the cream rise; these basins, which must not be of polished copper, are immersed in water, kept always at a temperature below 18° C. By this treatment the milk

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(1) See also No. 588, *B*. May 1913. (*Ed.*).

descends into the boiler without any natural fermentation taking place, and it retains its natural acidity unchanged.

2) Before the addition of the rennet, the selected lactic ferments (lactic bacilli) are added to the milk in the proportion of 1 per 1000 by volume; these micro-organisms possess the maximum fermentative power (virulence), obtained by growing them in a suitable sterilized liquid prepared on a basis of peptone and lactose neutralized with carbonate of lime. To ensure vigorous action, fresh ferment should be added regularly, without interruption, at 24 hours interval, and developed at a temperature of 32 to 35°C. (90 to 95°F.). Before each ferment is used the quantity necessary for the succeeding inoculation is set apart in the proportion of 5 per cent.

3) The form, on leaving the boiler, passes into a warm chamber at 37 to 40° C. (99 to 104° F.), the optimum temperature for the development of the bacillus forms of lactic ferments; here it remains for 12 to 14 hours, until the lactic fermentation is complete; this is recognized by the plasticity of the curd.

The experiments undertaken by Prof. Samarani have begun favourably, since about forty forms of Grana, which have been partly made from centrifugated milk, *i. e.* with milk which is difficult to work, have been kept during the summer months without signs of swelling.

Before, however, passing a definite judgment, it is necessary to wait two years longer and then carefully examine the qualities of cheese made according to the new warm-chamber method.

746 – **"Bankrote" Cheese** (1). — Teichert, Kurt in *Molkerei- Zeitung*, Year 27, No. 26, pp. 489-490. Hildesheim, April 4, 1913.

The writer has of late examined many "bankrote" Emmental and Münster cheeses, and has ascertained that their condition is not due to bacteria. If such cheeses are grated to a powder and the latter is mixed with an alcoholic solution of phloroglucin in hydrochloric acid, a red discoloration is seen. The cheese rinds showed a very strong reaction, which decreased as the centre of the cheese was approached. Cheeses which were not affected gave no red reaction with phloroglucin and hydrochloric acid. The writer, therefore, concludes that the red colour is principally due to the sap of the wood of the shelves having penetrated into the cheeses placed upon them. Cheese-shelves made of white spruce wood imparted the characteristic deep brown-red colour to the cheeses stored upon them.

747 - **The Microflora of Stilton Cheese.** — Percival, J. and Mason, G. Heather, in *The Journal of Agricultural Science*, Vol. V, Part 2, pp. 222-229 + figs. Cambridge, March 1913.

After a description of the methods adopted in the investigations, a detailed account is given of the micro-organisms found in Stilton cheese. The number of these is large in fresh cheese (1 000-3000 million per gram in the first week), but there is a gradual fall in the numbers up to the time of ripeness (100 to 150 days old), when 50 to 100 millions only are found.

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(1) This epithet is applied to cheeses in which the rind has assumed a brownish-red colour from long storage on damp shelves. The colour is quite distinct from that obtained with the phloroglucin reaction.

Five characteristic organisms were found in all Stilton cheeses examined, *viz:* 1) *Streptococcus lacticus,* 2) a short-rod form of *Bs. acidi lactici,* 3) a species of *Tyrothrix,* 4) *Penicillium glaucum,* and 5) a round form of *Torula,* sometimes accompanied or replaced by an oval form.

MEAT INDUSTRY

748 - **The Cattle Market and Cattle Trade at La Villette in 1912** (1). — ROLLIN in *Bulletin des séances de la Société Nationale d'agriculture de France,* Vol. 73, No. 1, pp. 47-54. Paris, 1913.

The following tables show the importance of the cattle trade at the La Villette cattle market in 1912, and give the prices as compared with those of the preceding year.

Number of animals taken to the cattle-market.

	Cattle	Sheep	Calves	Pigs
1912.	356 352	1 534 852	183 884	372 417
1911.	349 458	1 512 213	180 874	405 290
Increase (+) or decrease (—) in 1912	+ 6 894	+ 22 639	+ 3 010	— 32 873

Number of animals taken direct to the slaughter-houses.

	Cattle	Sheep	Calves	Pigs
1912.	79 961	935 141	199 752	338 915
1911.	79 816	898 607	195 360	284 325
Increase on 1912.	145	36 534	4 392	54 590

From a table for 1912 given in the original article, it is seen that the prices of first-class cattle are above the average for the year in the months of April, May, June, July and August. The prices are below the average in the last quarter of the year and in January and February. Cattle of the

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(1) See Nos. 95 and 180, *B.* Feb. 1913, and No. 594, *B.* May 1913. (*Ed*).

Average, Maximum and Minimum Prices at the La Villette Market.

Kind	Average Prices				Maximum and Minimum Prices			
	Pence per lb. meat							
	1st Quality		3rd Quality		Highest Price		Lowest Price	
	1912	1911	1912	1911	1912	1911	1912	1911
Cattle	7 3/4	7 3/4	6 1/4	6	8 3/4	9	4 3/4	4 1/4
Sheep	10 3/4	10 1/2	8 1/4	8	11 3/4	12	6 1/2	7
Calves	10 1/2	10 3/4	7 1/4	7 1/2	12 1/2	12 1/2	5 3/4	5 1/4
	Pence per lb. live weight							
Pigs	6 1/4	6	5 3/4	5 1/2	7 1/4	7	5 1/4	4 1/4

third quality fetch higher prices than the annual average in April, May and June, and lower in January, February, September, October and December.

The price of sheep is above the average in February, March, April, August, September, November and December.

The highest price for first-class calves was reached in January, February, March, April and May. Otherwise the price was always below the yearly average. The price fetched by calves of third quality was higher than the yearly average on January and April, and lower in the other months.

The price of pigs was higher from February to September; in the other months it was below the average price.

WINE-MAKING

740 - Cold and Ferments in 1912. — ASTRUC, H. in *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1009, pp. 541-545. Paris, April 17, 1913.

It is the firm conviction of the writer, based on his observations in 1913 in the vineyard and upon his laboratory notes, that the alcoholic fermentation of the vintage proceeds badly, or is prevented from taking place at all, when the temperature is below 18 to 20° C. (64 to 68° F.); this is the case even in the south of France, especially when the ferments are all sporulate to begin with, as occurs generally on healthy grapes at the beginning of the season, if the vintage is placed in a recently opened cellar in clean vats, as it always should be.

If it is desired to avoid the difficulties due to low temperature and to obtain the necessary fermentation without having recourse to a must-warmer, which is a costly apparatus as it is seldom used, the writer considers the only economical method is to *initiate fermentation artificially* by adding ferments in full budding, which would give the necessary heat to the liquid. These ferments could, if wished, be obtained from a native must, and their preparation would only entail the early gathering of a small quantity of grapes, or else the use of pure-culture or selected trade yeasts. The essential point is that they should be very active and bud rapidly; this entails the use of young yeasts and usually necessitates the addition of some starter (pied de cuve) made on the premises, or got from a neighbouring starter-establishment (zymogène).

Another very important point is to avoid drowning these yeasts in a large quantity of chilly must and thus paralysing their activity. Contrary to what is usually recommended, it is necessary, in years when the temperature is below 20°C. (68° F.) or thereabouts, to throw the starter simply on the surface of the pomace, or the must, without stirring it up; by this means the yeast will lose as little heat as possible and will produce actual centres of fermentation, whence the activity will radiate through the mass.

The must should only be aerated at the time of pressing, and all other customary aerations should, in this case, be avoided. The temperature of the upper third of the liquid alone need be watched, but when this exceeds 32° C. (90° F.) or thereabouts, it can be regulated by mixing in the lower third, avoiding all unnecessary aeration. If, at the same time, the necessary amount of sulphurous acid is reduced to the minimum, and if its hindering effect is corrected by introducing into the vat from 10 to 15 gr. of ammonium phosphate per hectolitre (about 2 ½ oz. per 100 gallons), which is an excellent nutrient salt for yeasts, the best measures have been taken to prevent any deleterious action on the fermentation which might be produced by early cold.

750 - The Maturation and Clarification of Wines by Means of Cold. — CARLES.

in *Bulletin de la Société des Agriculteurs de France*, p. 274. Paris, April 1, 1913.

The writer has already advocated for some time the use of low temperatures, either natural or artificial, in the maturation of wines. He shows in this article that the effect of the cold can be increased during refrigeration by putting the wine in active motion. This can be done in various ways, *e. g.* by beating the contents of the vats with a wine-shed broom, rocking the barrels containing the vintage, or by any other practical method.

If a solution of potassium bitartrate in artificially cooled pure water is subjected to similar mechanical action the deposition of the salt is more rapid and more complete. Should it be dissolved in wine, and especially new wine, or a mixture into which new wines enter, the relative amount of tartar deposited is still greater. This is due to two totally different causes, which have, however, the same result.

The first, which is entirely physical, depends on the property of the tartar of removing other substances. New wine is, in fact, a super-saturated solution of tartar. The cold releaves this super-saturation and diminishes the capacity of solution, especially if the temperature is very low and the cold is prolonged. When the tartar is thus insoluble in a medium containing substances in a state of unstable equilibrium, or in pseudo-solution, it has the power of combining with them and removing them. This union is known under the name of "laques".

The second case is chiefly chemical. When chilled new wine, in a barrel three-quarters full, is beaten vigorously or when a large surface of the chilled wine is exposed to the air, a certain quantity of oxygen is introduced into it. This oxygen is more soluble in wine near freezing-point than at ordinary temperatures. In dissolving, therefore, it combines by preference with those elements of the wine which are most readily oxidized; of these the blue pigments are the chief. By oxidation these pigments progressively lose their solubility, and thus from being pseudo-soluble they become wholly insoluble. The tartar possesses an especial affinity for these pseudo-soluble substances, which it abstracts from the wine till it itself reaches the equilibrium of saturation. But the reciprocal action is such that it is impossible for these oxidized pigments and ferruginous tannoids, which have individually been rendered insoluble, to separate out from the wine without, in their turn, removing part of the normally dissolved tartar even in the oldest wines.

It is for this reason that the first lees form after racking, which is a simple mechanical process, and that the sediment is so abundant.

The action of cold is thus only apparently physical and can be increased two-fold by the chemical action of the oxygen of the atmosphere, and even more by imparting motion to the wine in different ways.

The first result is, not only the elimination of the tartar and similar acid salts, which are present in excess, but also the removal of all the potentially insoluble compounds forming the blue pigment of new wine. The complex products of this separation form the first lees, and this general precipitation produces a self-clarification of the first order.

Herein lies the secret of the maturation of new wines by means of cold and the general elimination of their pseudo-soluble compounds. The experiment shows that these two processes are followed by a state of equilibrium and stability equal to that possessed by old wines. Further, it demonstrates that if wine kept at this low temperature is frequently racked off, it assumes the extraordinary limpidity and ruby colour so much admired by wine-makers and which is otherwise attained by exposing the product to the long-continued cold of many winters.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS.

751 – **The Law Respecting the Protection of Plants in Egypt from Imported Diseases.** — *Journal Officiel du Gouvernement Égyptien*, Year 40, No. 31, pp. 655-656. March 17, 1913.

On March 11, 1913, the Khedive of Egypt decreed as follows :

Art. 1. — The importation of cotton plants, cotton seed, unginned cotton and the wood of the cotton plant is forbidden. The importation in transit of unginned cotton and of cotton seed is likewise prohibited, unless accompanied by an official certificate testifying to their fumigation in the country whence they are exported.

Art. 2. — The importation of all live insects, as well as of their eggs, larvae and pupae is forbidden. The importation of all cultures of bacteria and of all fungi injurious to plants is also forbidden. The importation of silk worms and of bees is forbidden, except by special permission of the Department of Agriculture, and according to the conditions prescribed by that authority.

Art. 3. — The provisions of the two preceding articles do not apply to cotton plants, cotton seed or insects imported by the Department of Agriculture for scientific purposes.

Art. 4. — Date palms, banana plants, and sugar canes may not be imported except by special permission of the Department of Agriculture and in accordance with the regulations prescribed by the latter.

Art. 5. — Potatoes on their arrival at the Custom House may be subjected to examination ; should they prove to be infected with black scab (*Chrysophlyctis endobiotica*) they will be destroyed, with no compensation to their owners. Should the potatoes be found to be attacked by *Phthorimaea operculella*, they are to be fumigated at the expense of the receiver.

Art. 6. — Live plants imported into the country, and not included in the preceding articles (including the stems, bulbs, roots and all other portions of plants capable of growth, with the exception of seeds), shall be fumigated at the expense of the receiver. Exceptionally, plants arriving by parcel post will be fumigated at the expense of the Government. Trees and shrubs arriving at ports where there is no fumigating apparatus of sufficient size, will be sent on by sea to Alexandria, Port Said or Suez.

Art. 7. — The Minister of Public Works can, by means of a decree published in the *Journal Officiel*, declare foreign countries infected by diseases, or by fungi injurious to plants, and order the fumigation on their arrival, and at the receiver's expense, of all fruits and seeds mentioned in the decree and coming from these countries, or of unknown origin. All fruits and seeds are likewise subjected to fumigation, which, on examination by the agents of the Department of Agriculture, prove to be infected by a disease or fungus mentioned in this decree.

Art. 8. — All plants and fruits coming from abroad should be packed in such a manner as to facilitate their examination and, if necessary, their fumigation. In default of this the packages are liable to being opened at the risk of the receiver.

Art. 9. — Such parcels as are introduced into the country contrary to the provisions of the law in question must be re-despatched within 15 days, or otherwise they are liable to be destroyed without their owners having any claim for compensation.

Art. 10. — The regulations of the present law shall be enforced at the Custom House by the agents of the Department of Agriculture or by those of the Customs and Postal Services. In the case of boxes arriving overland, these regulations will be carried out by the Department of Agriculture at the first station on Egyption territory.

Art. 11. — Laws Nos. 10 of 1904 and 21 of 1909 forbidding the importation of cotton seed are abrogated.

Art. 12. — The Ministers of Public Works and of Finance are charged, in so far as it is in their power, to enforce this law, which comes into force 30 days after its publication in the *Journal Officiel*.

752 - **Proclamation of March 6, 1913, for the Protection of Bananas in British Honduras.** — *"The Plant Protection Ordinance 1912", Proclamation No. 1 of 1913, British Honduras.*

The importation into the Colony of bananas and plantains and of any seeds, cuttings or plants thereof, or any description of earth or any articles packed therewith or any package, covering or thing in which they may be packed is prohibited except in accordance with the conditions of a special licence given by the Governor on the occasion of each importation.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

753 - **The "Degeneration" of the Agen Plum.** — RABATÉ, E. Le Prunier d'Ente dégénéré. — *Revue de Viticulture*, Year 20, Vol. XXXIX, Nos. 1007 and 1008, pp. 483-489 and 525-530, figs. 71-80. Paris, April 3 and 10, 1913.

For thirty years a special affection of the Agen plum tree (Prunier d'Ente, or Robe de Sergent) has been recorded. The disease is recognisable by a combination of clearly distinguished external characters and is known as degeneracy, anomaly, deterioration, sterility, male plum, etc. The branches of the affected tree are bare at intervals; the twigs are thick and short, with an almost regular diameter; the leaves are wide and glossy, and grow in tufts; the flowers occur in thick clusters, while the fruits are rounded and very few.

So far the investigations of this disease do not permit of its being attributed to any definite parasite. The writer considers it provisionally as due to great irregularity in the food supply of the tree, especially as regards water.

To avoid this disease spreading in new plantations, the following conditions are necessary: fresh, calcareous, permeable soil; stocks adapted to the soil; scions taken from healthy, strong, productive trees with long leaves and pyriform fruit.

Sowing the stones of Agen plums produces good stocks, and even new types of this variety without grafting.

Abnormal Agen plum trees, if not too old, may be re-grafted with greengage or other varieties.

No exact results have been obtained by the use of fertilizers, insecticides and fungicides; and certainly new systematic investigations are very necessary.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

754 – **Chinese Fungi** (1). — MIYAKE, ICHIRO in *The Botanical Magazine*, Vol. XXVII, Nos. 314 and 315, pp. 37-44 and 45-54, plate 1. Tokyo, February and March 1913.

This is a new contribution to the mycological flora of China and includes 31 species parasitic on cultivated or other useful plants, collected in 1908 in South China and in 1910 in the neighbourhood of Pekin. The following are new to Science: *Uncinula Koelreuteriae* on the leaves of *Koelreuteria bipinnata* Frank; *Phaeosphaeria Eriobotryae* on the leaves of *Eriobotrya japonica* Lindl.; *Melampsora Periplocae* on the leaves of *Periploca* sp.; *Phacopsora Compositarum*, on the leaves and stalks of *Aster* sp. and of *Artemisia* sp.; *Coniothyrium Rhamni*, on the leaves of *Rhamnus* sp.; *Melophia Polygonati*, on the leaves of *Polygonatum officinale* All.; *Marssonia viticola*, on the leaves of *Vitis vinifera* L.; *Cercospora Clerodendri*, on the leaves of *Clerodendron* sp.

755 – **The Barberry and its Relation to Black Rust of Grain.** — *Communication from* H. T. GUSSOW (*Dominion Botanist, Canada*), *Experimental Farm, Ottawa, to the International Institute of Agriculture.*

Many years before the distinguished Mycologist, Anton de Bary, of the University of Strassburg, had shown by scientific investigation (in 1865) that the barberry (*Berberis vulgaris* L.) played an important role in the spreading of black rust of grain (*Puccinia graminis*), practical farmers in the Continent of Europe were convinced that the rust specks on the barberry had some connection with the grain rust. Naturally the interpretations of this observation were merely fantastic. Within recent years, and as the knowledge of the life history of these destructive grain parasites advanced, the fact that barberry rust and grain rust were closely related became more and more established. It was clearly proven that the barberry served as an intermediate host for the fungus on grain. However, there has been entertained considerable doubt or lack of appreciation as to the correctness or practical use of this observation, which was regarded as a mere theory. It was pointed out by several other investigators that in certain districts of Hungary and Sweden very few barberry bushes existed, and still black rust seemed to persist. Dr. Barclay, the pioneer Indian mycologist, cited a particularly interesting example, referring to the grain growing districts of the East Indies where there is no barberry to be found within 300 miles of that area. However, beyond this distance in the mountainous regions there were barberry bushes growing. We may note that although in these cases " there were hardly any barberries left " or " they were 300 miles away from the grain growing district " yet there certainly existed some barberries all the time. One of the first European countries which took the matter seriously was Denmark. By means of an Act this country enforced the systematic destruction of the barberry. It has been stated by Dr. Lindau (in 1908) that notwithstanding the destruction of the barberry, black rust of grain continued its devastations, although the intensity of the infection varied to some extent. This latter observation, of course, may be commonly made any one year, the rust varying considerably according to districts or climatic conditions.

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(1) See No. 1099, *B.* July 1912. (*Ed.*).

In the report of the Dominion Botanist for 1911, p. 239, the present status of our knowledge of rusts was briefly summarized, and it was stated: that it had been found in Denmark, for instance, that the compulsory destruction of barberry has not brought a reduction in the severity of rusts. This statement was eventually read in Denmark, and we are indebted to Dr. J. Lind of the Phytopathological Experimental Station, Lyngby, Denmark, for a letter in which he refers to this statement explaining that: " *Puccinia graminis* is quite perceptibly disappearing in Denmark year by year to the same degree as we get rid of the Berberis, and we are very satisfied with the results of the Berberis Act. "

This communication contained important information of a more definite character than any we had been able to secure previously. We thought it, however, desirable to seek the opinion of another Danish plant pathologist and comunicated with Dr. F. Kölpin Ravn of the Pathological Museum of Kopenhagen. He very courteously writes us under date March 26th:

" In your letter of Febrary 27th you desire to know what my personal experience has been concerning the extermination of barberry bushes in this country. I have been able very often to observe early outbreaks of *Puccinia graminis* on rye and oats ; in all such cases - without any exception-we have been able to find some barberry bushes near by"; and some years after the removal of these bushes these early outbreaks of rust had disappeared.

"Several of the local advisers in Plant Culture carried on a systematic fight against the barberry bushes, as required under the Act. And at present the early - and only dangerous - outbreaks of black rust are rarely reported. I may add that the farmers practise for some recent years sowing spring grain earlier than before, which further helps in the fight against the rust. I think, therefore, that the present very slight infections by *Puccinia graminis* are the result of the two named factors taken together."

From these two letters it would appear that the systematic destruction of the barberry, green and purple leaved - for the aecidia of the rust fungus occur on both - would produce a very desirable effect, *i. e.*, the checking of the severity at any rate of that most dangerous rust of grain culture.

The barberry shrub, it must be realized, is worthless as compared with the immense value of cultivated grain. In order to protect the grain industry as much as possible, the destruction of the barberry wherever it grows is strongly advocated.

MEANS OF PREVENTION AND CONTRO

756 - **Spraying Fruit Trees with Lime-Sulphur Wash** (1). — MARRE, E. in *Le Progrès agricole et viticole*, Year 30, No. 17, pp. 529-532. Montpellier, April 27, 1913.

From the results of a second year's experiment as to the efficacy of lime-sulphur wash against the diseases of fruit trees (peach, apple, pear) the writer recommends this wash as a successful means of controlling leaf-curl of peaches (*Exoascus deformans*) and apple scab (*Venturia inaequalis*).

In order to obtain good results, the mixture must be applied three times: *a*) just before flowering; *b*) when the blooms are falling; *c*) three weeks later.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

757 - ***Bacillus Capsici* n. sp., causing Shrivelling of Capsicum** — PAVARINO, L. and TURCONI, M. Sull'avvizzimento delle piante di *Capsicum annuum* L. — *Atti dell'Istituto Botanico dell'Università di Pavia*, Series II, Vol. XV, pp. 207-211. Milan, 1913.

In 1912, the cryptogamic Laboratory of Pavia received stems of capsicums from Bergamo and Treviglio (Province of Bergamo), and also from Tortona (Province of Alexandria), which were more or less affected by a disease described previously as wilting or disease of capsicums by Montemartini (1907), and as capsicum rot by Noelli (1910). The former attributed the disease to *Fusarium vasinfectum*.

On examining the material sent, the writers also discovered a *Fusarium*, but as this only appeared on parts of the roots which were eaten away and dead, they do not consider that this fungus is the cause of the disease. They rather attribute it to the presence in the cells of the affected tissues of a micro-organism which they isolated and which cannot be confused with *Bacterium Solanacearum* Smith. They describe the parasite and name it *Bacillus Capsici*.

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(1) See No. 423, *B*. Feb. 1912, and also No. 72, *B*. Jan. 1913 and No 317, *B*. March 1913. (*Ed.*).

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

758 – **A Contribution to the Control of Dodder. Destruction of the Seeds.** — BRESAOLA, M. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 89-136, plates V-VII. Modena, 1913.

According to the researches of the writer, the seeds of *Cuscuta arvensis* and of *C. Trifolii* (1) are certainly more susceptible to heat than those of the chief leguminous meadow plants (lucerne, red clover, Dutch clover and bird's-foot trefoil). After dry heating, the seeds of *C. Trifolii* and *C. arvensis* largely lose their powers of germination. After being heated to the maximum temperature endured by leguminous seeds, a certain number of the hard dodder seeds remain unhurt; the number is relatively high in the case of *C. Trifolii* and very small in that of *C. arvensis*. The following temperatures have proved most efficacious: 65° C. (149° F.) for two hours; 70° C. (158° F.) for 30 minutes; 70° C. (158° F.) for one hour; 75° C. (167° F.) for 30 minutes; 75° C. (167° F.) for one hour. Further experiment is needed to find out which is the best. The length of the heating had more effect upon *C. Trifolii* than the height of the temperature. Seeds of Leguminosae, when exposed dry to these temperatures, are not harmed; in fact, their germination capacity and energy were increased. Dry heating of hard seeds of Leguminosae has thus a favourable effect upon their germination.

The writer further observed that *C. arvensis* does much less harm to crops than *C. Trifolii*, and that the injury due to the former is less than is supposed, for which reason the restrictions placed upon the seed trade by some States appear to be unnecessarily stringent. Only a very severe attack of *C. arvensis* can cause the destruction of a crop, and even if leas are badly infested the pest tends to die out; thus, though the first cut may be lost, the second and third, especially the latter, are usually saved. The attacks of *C. Trifolii*, on the other hand, even if at first insignificant, may become very severe and finally lead to the destruction of a lea. Slight attacks of *C. arvensis* never cause appreciable damage, especially when due to the intermimittent germination of hard seeds.

In the first year of the cultivation of ground much infected with *C. arvesis*, the writer succeeded in obtaining perfectly immune plots by heating the seeds before sowing. *C. Trifolii* does much less harm to crops of bird's-foot trefoil than to those of clover and lucerne. In fields of bird's-foot trefoil *C. arvensis* germinates normally, but disappears gradually of its own accord without doing any harm. From the few observations which it has so far been possible to make the writer concludes that *C. arvensis* is much less resistant to cold than *C. Trifolii*.

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(1) According to the *Index Kewensis*, *Cuscuta Trifolii* is a synonym of *C. Epithymum*. (Ed.)

759 – **Correlation between the Degree of Ripeness of the Seeds of Leguminous Weeds and the Rapidity of their Germination.** (1) — MUNERATI, O. and ZAPPAROLI, T. V., in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 137-145. Modena, 1913.

During the summer of 1911, the writers undertook observations on the germination of seeds of leguminous weeds which reach the soil at various stages of ripeness, after falling or being detached by force from the plants; the species chosen were *Vicia segetalis, V. hirta, V. Cracca* and *Lathyrus Aphaca*, all typical arable weeds in the Lower Po valley. From the first experiments, the following conclusions are drawn:

a) In leguminous seeds which have not attained complete maturity on the parent plant, the integument is very permeable to water, so that they readily germinate as soon as they find favourable conditions of humidity in the soil; perfectly mature seeds, on the other hand, remain for a long time without germinating, because they have not the power of absorbing water.

b) Ploughing or mowing the stubble, which should be effected as soon as possible after the wheat is harvested, are of special importance in the control of leguminous weeds; by cutting down plants with ripening pods, many seeds are prevented from completing the seed-coat, which would have served to keep them for a long time in a dormant state in the soil.

c) Ploughing need not necessarily be shallow, for the unripe seeds readily take up water and thus germinate equally quickly whether they lie on the surface or are buried to some depth.

d) Weed seeds attacked by *Bruchus* are in most cases deprived of all vitality, but the few which are capable of germination develop immediately on meeting with suitable conditions.

Further researches were also devoted to determining the behaviour of leguminous seeds of different degrees of maturity; the following observations were made with lucerne seed: *a*) the riper the seed at harvest time, the larger is the number of seeds possessing an integument impermeable to water and *vice versa*; *b*) within certain limits, seeds germinate more rapidly, the longer the time which has elapsed between the harvest and the moment when they find themselves under favourable germinating conditions.

760 – **The Effect of Alternate Periods of Humidity and Drought upon the Germination of the Seeds of Wild Plants.** — MUNERATI, O. and ZAPPAROLI, T. V. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 3, pp. 157-195. Modena, 1913.

The slow or rapid changes in the moisture of the medium in which seeds happen to be, have very different effects upon those belonging to different species of weeds.

Some seeds are induced to germinate quickly when they are placed for a short time in a damp medium, after having remained for long consecutive periods in a dry medium (alternation of three months in a dry medium with one week in a damp one).

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(1) See No. 432, *B*, April 1913. (*Ed.*).

In a constantly damp medium, only some of the same seeds germinate and these very slowly ; while those which do not germinate often rot. The following behave in this manner: *Avena fatua* (large and small seeds), *Galium Aparine*, *Papaver Rhoeas*, *Plantago lanceolata*, *Amaranthus retroflexus*.

There are other seeds (*Rapistrum rugosum*, *Myagrum perfoliatum*, *Sinapis arvensis*, *Salvia pratensis*, *Abutilon Avicennae*, *Setaria italica*, *Oenothera biennis*) which, like the former ones, germinate in much larger proportions when the humidity is not continuous, but the total percentage of germination is always less.

Some seeds (*Calystegia sepium*, *Lappa major*, *Sorghum halepense*, *Solanum nigrum*), whatever the variations in the dampness of their medium may be, only germinate in very small numbers, even if numbers of them remain alive for a long time. Others again (*Vicia segetalis*, *V. Cracca*, *V. hirta*, *Lathyrus Aphaca*, *Cnicus arvensis*, *Eruca sativa*, *Daucus Carota*, *Cuscuta Epithymum*) always germinate successively and in about the same numbers, independently of the variations in the dampness of the medium. Seeds which are impermeable to water, and typically those of the Leguminosae, have (according to the results of the writers' researches) proved themselves to be less susceptible to variations in humidity; but other species of seeds have likewise behaved in the same manner.

There is yet another class of seeds which germinate in a greater or less proportion when dry and damp periods alternate, while they do not germinate in a medium which is constantly moist, although they are evidently mostly living. The seeds of *Panicum Crus-galli* and of *Rumex crispus* behaved in this manner in the experiments (80 to 90 per cent. of the seeds obviously living after remaining two years in wet sand) ; while the seeds of nearly all the other species placed in the same conditions either germinated or rotted. This probably explains why the above-mentioned plants are among the most abundant weeds in irrigated land.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

761 - **Parasitic Fungi in the Control of the Larvae of *Chelonia caja*.** — PASTRE, JULES. Les chenilles bourrues. — *Le Progrès agricole et viticole*, Year 30, No. 16, pp. 491-492. Montpellier, April 20, 1913.

PICARD, F. L'*Empusa aulicae* et la mortalité des chenilles bourrues. — *Ibidem*, No. 17, pp. 521-522. April 27, 1913.

A serious invasion of woolly bears (*Chelonia* [*Arctia*] *caja*) is at the present time ravaging a portion of the vineyards of Hérault.

On many of the already dried up or visibly diseased and dying larvae M. Pastre found a fungus, probably *Sporotrichum globuliferum*. Nevertheless, he believes that the first caterpillars only were attacked by the parasite, and that the new generations have resisted the pest until the present time.

M. Picard considers that the mortality among the woolly bears this year is due to two very distinct diseases, the first being attributable to *Empusa aulicae* rather than to *Sporotrichum globuliferum*, while the second is caused by a totally different organism, which he is investigating, and concerning which he will shortly publish further particulars.

762 – **On the Comparative Effects of Arsenic and Lead in Compounds used in the Control of *Conchylis*.** — MOREAU, L. and VINET, E. in *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, First Half-year, Vol. 156, No. 11 (March 17, 1913), pp. 906-908. Paris, 1913.

It has been repeatedly recorded that in vineyard plots which had been successfully sprayed with arsenate of lead, the *Conchylis* larvae which escaped destruction were small, weakly, yellow and capable of effecting very little injury. In neighbouring plots treated with other insecticides (nicotine, for instance) the surviving larvae were, at the same date, normal, well-developed and as strong as the control specimens.

The writers wished to test the value of this statement by weighing the larvae and ascertaining whether the special effect attributed to arsenate of lead was due principally to the arsenic, or to the lead. The weights obtained proved that the effect noticed was essentially due to the arsenic. A similar result was obtained with copper arsenate, but iron arsenate appeared to be a very weak insecticide.

These observations show that, in order to estimate at its proper value the efficacy of arsenical applications in general, it is not only necessary to count the dead larvae, but also to observe those which have survived the action of the poison and which, at the usual time of the propagation of the *Conchylis*, are late in their evolution. It is not certain that this evolution will be complete, and even if it were, it is probable that the moths resulting from these larvae would be less fertile. In any case, the second generation, being very late, would do less injury.

It does not appear form the preceding researches that other arsenic compounds can be substituted for arsenate of lead; for, according to the observations of the writers, the treatment is most efficacious and the mortality largest with arsenate of lead as compared with other arsenical sprays.

763 – **Control of *Epicometis hirta* in Hungary.** — FÁBIÁN, MIKLÓS in *Köztelek*, Year 23, No. 32, pp. 1159-1160. Budapest, April 26, 1913.

Epicometis hirta, which attacks by preference the flowers of fruits trees, has this year invaded the fruit garden of the Normal School of Agriculture at Komarom. The garden consists of two parts: the nursery, which is tilled, and the orchard which is in grass.

All the fruit trees were in blossom when the appearance of *Epicometis hirta* was recorded, and in spite of energetic measures, the ravages of the pest could not be checked. Further, the practice of shaking the branches and collecting the fallen insects had its inconveniences, for on the one hand, the shaking caused many of the blossoms to fall, while on the other, many of the insects found shelter in the interior of the flowers, or even flew off before it was possible to collect them. During the operation, the writer noticed the curious fact that the insects only appeared towards 10 a. m.;

when the temperature rose, and were first found on the trees of the orchard, not appearing until later on those in the nursery. After a careful search, many of the pests were discovered upon flowers growing in the orchard, especially on dandelion (*Taraxacum officinale*), some of these harbouring as many as 4 or 5 insects at a time. Most of these individuals had their backs covered with mud, which leads to the conclusion that *Epicometis hirta* passes the night in the ground and then first proceeds to the flowers nearest the soil, choosing dandelious by preferennce. This explains why the orchard was attacked before the nursery. As a result of this observation, the writer began to hunt these insects at 8 a. m, collecting them especially where dandelions were in flower. The first day 3 quarts of *Epicometis* were thus obtained, and after a few days the first trees were entirely freed from these pests.

INSECTS INJURIOUS TO VARIOUS CROPS

764 - ***Promecotheca cumingii*, a New Pest of Coconuts in the Philippines.** — JONES, C. R. A New Coconut Pest. — *The Philippine Agricultural Review*, Vol. VI, No. 2, pp. 105-106. Manila, February 1913.

The writer records *Promecotheca cumingii* Baly, a beetle belonging to the family *Chrysomelidae*, subfamily *Hispidae*, as being a new insect, which is very destructive to the leaves of the coconut palms in the Philippines; the damage is done chiefly by the larvae, though the adult insects do some injury.

The eggs, larvae and pupae suffer much from hymenopterous parasites, the infestation being over 50 per cent. Should the beetle, nevertheless, increase in such numbers as to cause a serious outbreak, its control could probably be easily effected by collecting and destroying the infested leaves.

765 - **Scale Insects Injurious to Orange and Lemon in Spain.** — DE SALAS Y AMAT, LEOPOLDO. *Las plagas del naranjo y limonero en España*, 196 pp., 8 figs. Madrid, 1912.

The writer first describes the chief scale insects of orange and lemon in Spain. The following is a list of them:.

Chrysomphalus dictyospermi var. *pinnulifera*: called "poll-roig" in Valencia, Tarragona and the Balearic Isles, "piojo rojo" and "cochinilla roja" in Murcia and Andalusia.

Aspidiotus hederae: "poll-blanc" at Valencia, "cochinilla blanca" and "piojo blanco" in Andalusia.

Parlatoria zizyphi: "poll-negre" at Valencia.

Mytilaspis citricola: "serpeta" at Valencia and in Andalusia, "purple scale" or "escama purpurea" in California.

M. gloverii: "serpeta larga".

Dactylopius citri: "cotonet" at Valencia, "algodon", "cochinilla algodonosa ó de la tizne" in Andalusia, and "chinche harinosa" in the United States.

Saissetia oleae: "black scale" or "escama negra" in California, "cochinilla del olivo", "cochinilla de la tizne", "melaza" or "tizón".

Sr. De Salas then passes to the question of the destruction of these pests by means of their natural enemies, and enumerates various well-known insects which control the above-mentioned scales.

He also speaks of artificial control methods and considers that liquid insecticides are generally more trouble than they are worth; the one exception is lime-sulphur wash, of which details are given.

Fumigating with hydrocyanic acid, a practice of relatively recent introduction into Spain, is the best means hitherto adopted in the control of the scale insects of citrus trees; the writer describes the details of this treatment, which was known and applied in America as long ago as 1886, if not before.

The results of the experiments and observations made hitherto regarding this remedy are as follows : *a*) the use of hydrocyanic acid solves the problem of the control of the citrus scales of Spain ; *b*) fumigating is the most economical method for obtaining the desired results and is attended with no danger ; *c*) thanks to this system, *Chrysomphalus dictyospermi* var. *pinnulifera* can now be considered as extirpated in Spain ; *d*) hydrocyanic acid is an equally effective remedy against other scale insects ; *c*) it is necessary to continue the study of *Dactylopius citri* in order to determine the best date for the application of the remedy and the minimum cost of its application ; *f*) in order to meet the necessary expenses of the fumigation method, it is absolutely necessary to develop the spirit of co-operation amongst the different local agricultural classes ; *g*) it is necessary to reform the " Ley de Plagas del campo " so as to make hydrocyanic fumigations obligatory in all citrus districts as a remedy for pests which have been proved to be eradicable by this means.

In conclusion, the writer mentions the sum of £6 000 given by the State for the development of the method of controlling *Chrysomphalus*, and gives some special instructions as to the practical application of the treatment described.

ALFREDO RUGGERI, gerente responsabile.

INTERNATIONAL INSTITUTE OF AGRICULTURE
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NB. The Intelligence contained in the present Bulletin has been taken exclusively from the books, periodicals, bulletins, and other publications which have reached the Library of the International Institute of Agriculture in Rome during the months of May and June 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Progress of Cereal Seed Selection in France

by

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Until the last few years the experiments on the production of the best cereals and their multiplication had been undertaken in France only by seedsmen, who, however, were well qualified for the task. For the last century they have studied foreign products, especially the English, comparing them with the local varieties, and then, having made their choice, they gave those varieties which seemed to have a sure future before them to experienced farmers for reproduction on a large scale, after which they distributed them at first in the richest provinces and then throughout the whole of France.

The firm Vilmorin has always occupied the foremost position in this introduction of foreign seeds. The chief stages of this work are known by the detailed description of the varieties exhibited about the middle of the nineteenth century at the English, Belgian and French agricultural shows, and then by the publication, several times rearranged, of a *Catalogue méthodique et synonymique des Froments* (1850 and 1895) and of well illustrated volumes bearing the titles of *Les meilleurs blés* (1880) and *Supplément aux meilleurs blés* (1909). The firm Denaiffe at Carignan (Ardennes) has contributed to introduce the best varieties of oats; the work of Messrs. Denaiffe and Sirodot, *l'Avoine* (1901), completed in 1908, is a monograph presenting the greatest interest to farmers, merchants and biologists. Lastly, in several large agricultural centres the Experiment Stations publish regularly the results of their comparative tests of the novelties recently produced in the country or imported from abroad. Thus M. Florimond Desprez has summarized the results of his experiments in a series of pamphlets and articles under the title *Culture des différentes variétés de Blés à la Station expérimentale de Cappelle* (Nord) (1888 and following years).

These publications have been very useful to the farmers of the North of France, of Flanders and of Belgian Hainaut.

On the other hand experimenters of great capacity and men of science among whom may be mentioned Louis and Henry Lévêque de Vilmorin, Schribaux, Gatellier, Philippe de Vilmorin, have contributed to keep awake in our country the desire of knowing the varieties most adapted to our soils. They would have continued and developed the works of Lecouteur in Jersey, of Desveaux at Anges, of Seringe and of Jordan at Lyons if the evolution of the seed trade and industry had not to a certain extent limited their intentions. The sale of grain on samples, the disappearance of markets, and the substitution of great mills for small local ones have brought in their train uniformity of prices and have caused the disappearance of that care with which the seeds of various qualities were studied and classified about the middle of the nineteenth century. The farmers of the last two generations only care to obtain as cheaply as possible the seed capable of giving the highest yield of crop to be sold by weight. The use of heavy doses of chemicals has created a demand for rapidly growing varieties with stiff straw and compact ears, capable of standing liberal nitrogenous manuring without lodging. Thus excellent local varieties were set aside on account of a single defect and the choice of new varieties was determined more by the absence of some defects than by the possession of real qualities. It may be said for the great bulk of our cereals that this is the system still prevailing.

Nevertheless it ought not to be forgotten that (excepting the resistance to intensive manuring) the aptitudes of varieties to give heavy crops have a notable influence on final results. In the United States, selection by pedigree with valuation of the lines according to their descendance (centgener power) has enabled Mr. W. N. Hays to replace *Fife* and *Blue stem* wheats by *Minnesota* No. 163 and *Minnesota* No. 169 derived from them. The average yield per acre was increased by 1 ½ bushels, which signifies a yearly increase of crop estimated at a million dollars for Minnesota alone. Similarly in Sweden, according to the calculations of M. Nilsson-Ehle, the recent substitution of the pedigree wheat *Extra Squarehead II* for its parent *Extra Squarehead I*, which was already highly appreciated, gives an increase of yield of 15 per cent. It is thus highly advantageous, from the only point of view at present taken by farming on a large scale, to adopt pedigree seed; but this subject has already been very well treated in the previous Bulletin by Messrs. N. Hjalmar Nilsson (1) and Nilson-Ehle (2) and I shall not insist further upon it.

The work done at Svalöf was not known in France before the commencement of this century. A pamphlet by M. Basil Macalik on *Hanna Barley* (1900) made the managing committee of the syndicate of French brewers acquainted with the methods followed at Svalöf; they considered it advisable to visit the Svalöf Seed Experiment Station and to introduce the Swedish pedigree varieties in some centres where good French barleys were raised (1902). The malting of the pedigree barleys having given good industrial results a *Society for Promoting the cultivation of Malting Barley in France* (1903) undertook to carry out the following program: " 1. Introduction into France of the Swedish pedigree varieties and surveillance over those lots which preserved their purity. 2. Separation from the best native varieties of pedigrees which might later replace the Swedish pedigrees ".

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(1) N. H. NILSSON: The Swedish Institute for the Improvement of Field Crops at Svalöf. — *B*, June 1913, pp. 834-843.

(2) H. NILSSON-EHLE: Improvement of Wheat and Oats at Svalöf, *Ibid.*, pp. 844-852.

The guaranteed capital of the new Society, upwards of £ 2 000, was not utilized. The members defrayed the annual expenses of purchase, distribution and control of Swedish seed and the cost of research of native pedigrees by shares, the total of which was kept between £200 and £240. This slow method applied patiently during ten years had the result of preparing the majority of maltsters for this kind of work and of not alarming farmers, who mistrust any more or less interested initiative.

The success that attended the movement gained the support of the scientific institutions and of the Government. In 1908 the *Académie des Sciences de Paris* granted the botanist of the Society a subvention from the Bonaparte fund, in consideration of " the great theoretical interest of his researches and of the important practical applications they will have ". From 1909 to 1911 the *University of Paris* facilitated the extension of the work by a subvention from the Commercy Legacy ; in 1912 the Minister of Agriculture granted the Society itself a subsidy. The *Institut Pasteur* of Paris hospitably offered the use of its laboratories and granaries for the study of plants during the winter, and an agricultural biological service was soon created (1909) with a much larger programme, embracing research on all the cereals, on tobacco, fruit-trees and some other industrial plants. The processes of selection by pedigrees devised at Svalöf have since that date been applied to the selection of domestic animals as regards their productivity and resistance to disease.

The principal practical results obtained by this work on cereals, continued for ten years, are the following:

Among the Svalöf pedigree varieties which have given excellent results in France *Princess* barley deserves to be mentioned as foremost of all. Its somewhat slow ripening is amply compensated in some districts by a remarkably high quality of grain and heavy yields. *Hannchen* barley is too early and soon degenerates in Champagne where Nolč's *Bohemia* keeps true longer. *Chevalier II* barley of Svalöf does very well in Mayenne, where it has been grown for ten years ; on the contrary, it has not been possible to keep *Primus* and *Svanhals* true, even in the North of France.

For this region the Society has prepared and studied with care the pedigree varieties selected from the local varieties. *Bourbourg* and *Cistercienne*, of which it possesses several well tested lines, suit the fertile soils of Flanders, Belgian Hainaut and the country round Paris ; but the profits that can be realized without great efforts from the cultivation of wheat will always keep the growing of pedigree barleys in a secondary position nowithstanding the fact that the many maltsters of the country are disposed to pay handsomely for them. On the other hand the raising of native pedigree kinds has much developed in Haute Loire and Indre, in Maine, where a new pedigree barley *Comtesse* (0.117) thrives well, in the neighbourhood of Saumur and in Aube, where the pedigree barley *Sarah* (0.156) has stepped into the front rank formerly held by *Bohemia*. In the centre, in Allier and Puy de Dôme, *Chevalier français III* (0.302), of the same origin as *Chevalier II* from Svalöf, succeeds better than the latter and yields heavier crops because it is later.

The problem of the improvement of wheat, especially from the theoretical point of view, is still in its preliminary stage; the selection of oats and rye do not seem to hold out any immediate prospect of utility in France. For fairly rich soils we have some good varieties of oats which are much esteemed on the markets, and the use of Svalöf pedigrees is recommended for rich soils. The acquisition of several early and medium-early large-grained maizes has not been followed by any demand for them on the part of the farmers and we are always more and more dependent on America for this cereal.

It must be recognized that the movement in favour of the pedigree varieties of cereals is still very limited, and that it has arisen without the active cooperation of farmers, who watch its progress with scepticism, if not with indifference; this depends without doubt on the subdivision of the land and of estates, on the still rudimentary education of farmers, and on the independence and easy life of the peasant proprietors, who sell their wheat at a high price. There is no demand in France for better seed on the part of farmers; what they find in abundance on the market seems good enough for them.

Swedish landowners are more highly educated and for the most part farm larger holdings; they are subject to a severer climate and have associated spontaneously with the object of soliciting the aid of competent botanists who have specialized in the study of one or more farm crops. Grouped into a Society to which they contribute their financial and moral support, they were not long in profiting largely by the discoveries, which every day become more important, made by their scientific fellow-workers. The Svalöf institutions, which thirty years ago constituted only a small private society, have drawn into their movement thousands of farmers of all the provinces of Sweden and represent a great national asset.

In France, the progress achieved is in reality only the result of the competition which causes evolution of the food industry.

Thus it is the directors of breweries, and the chemists familiar with the utilization of malt, who really select malting barleys in France. They alone can appreciate the value of pedigree lines among which the botanist would hesitate before making a final choice. The brewers then demand from the maltsters the necessary precautions to prevent the choice barleys being mixed with others; these consent to make on their own estates the experiments of mutiplication of those predigree lines that the Society hands over to them in small quantities; they then increase their prices for all the important lots, the purity and origin of which are guaranteed; it is only by this surplus value of the crops that the farmers have been hitherto induced to respond to the invitations of the brewing industry. This transitory and still quite localised effort has had a very curious result: the high prices offered for the pedigree varieties available on the market have caused a rise in the prices of ordinary barleys, even the most common, of those districts; and this success, which was not foreseen, has allowed local farmers to realize considerable profits to the detriment, fortunately only temporary, of those who have spread the new methods and seeds.

In analysing the causes of the indifference of French farmers to the progress of the improvement of seeds, the following may be mentioned as the most important: the subdivision of the holdings, the affluence, or at least the easy circumstances, of the French peasant and farmer and especially their fear of the unknown, of experiments, and of that unsettledness which is so dangerous to small farms. The foresight and the doubts of our farmers, which are often called ignorance and spirit of routine, forcedly limit the efforts of the most enterprising merchants and of the most confiding industrial firms. Nevertheless, if the system at present adopted by the brewers endures long enough to offer some security to the farmers, there is no doubt that there will be a rapid and decided progress.

The industrial firms that purchase are decided to maintain their demands; the education that they have had gives them full confidence in the pure products that can only be guaranteed by the use of pedigree varieties. Having obtained unexpected results from the use of pure ferments, from the preliminary sterilization of worts discovered by Pasteur, they become enthusiastic partisans of the Svalöf methods based upon the same principles. The following are some other examples of the applitions of the same method.

The problem of the economic production of wheat possessing high baking value, which causes such extensive work in Canada, in the United States, in England and in British India, is hardly known in France, and yet our millers pay American wheats, with which our markets are not always provided, five times their value; a small quantity of those wheats, suitably mixed vastly improves our spring wheat flours, which are almost all starch, and which are at present the most widely spread kind. It is under the indirect form of freeing our millers from American imports that the problem of improving French wheat will be presented. In 1909 the Director of Agriculture at the Ministry of Agriculture, M. Vassillière, requested me to examine the question under this aspect by preparing an enquiry on the varieties of wheat at present grown in France.

The selection commenced in 1908 by the Sugar Company of Bourdon corresponds very closely to the same object. The fertile plains of Limagne which supply the Puy de Dôme sugar factories with sugar-beets are also an important centre for the production of semolina wheats which are bought at a premium by the Marseilles mills. The ever increasing extension of this industry has kept the prices of the raw material sufficiently high to render for the last thirty years the semi-hard long-strawed wheats, which are sown in the autumn after beets, one of the steadiest sources of profit of the district. The not very high prices of sugar during the last few years have not seriously affected the Bourdon sugar factories, who have convinced their clients that beets are an accessory crop which prepares the soil to produce good and highly remunerative wheat.

The problem of the improvement of Limagne wheats was put before me in 1908 in the following form. Is it possible to obtain from the Taganrog variety grown in the district for the Marseilles mills, lines maturing earlier than the varieties hitherto known, but equally productive and less liable to rust? I proposed to adopt the method of "pedigree culture" so judiciously used at Svalöf, and, without great expense, at the end of four years we obtained results which represent a considerable progress on the point of departure; of the six lines chosen as being decidedly superior to hundreds of others mixed with them only one or two are to be grown on a large scale. But it must especially be remembered that the botanical selection of the Limagnes wheat has been undertaken by chemists and directors of sugar mills, men who have long been familiar with the technique of selection and with the statistical control of hereditary qualities; with the assistance of these competent men, progress has been rapid

Our farmers, with their imperfect education, can hardly be reproached for showing a certain distrust of this form of sales and for entertaining the suspicion that the offered premiums conceal some snare. They have only recently protected themselves by special laws against frauds in the fertilizer trade and they are always threatened by the invasion of their markets by substitutes for milk, butter and even meat. But they will not resist the strong temptation to buy the best seeds and to raise from them the best crops of the district. Thus full confidence can be placed in the future of pedigree and guaranteed varieties. The security which results from their use and the higher value of their crops are two elements of success that cannot be weakened by some commercial agreement respecting the control of the produce that is delivered.

It is besides indispensable that the societies that distribute the seeds should analyse them regularly at every generation. They must prepare themselves to replace from time to time by new varieties those which no longer afford full satisfaction. This is done by the Svalöf Society for the Purchase and Sale of Seeds, and in France by the Society for Promoting the Cultivation of Malting Barleys.

After three successive attempts to introduce Svalöf *Princess* barley into Champagne, the managing committee was convinced that the crops would be only moderate in wet years and decidely bad in dry ones. Farmers, grain-brokers, maltsters and brewers were all agreed upon this point, because the results obtained from pure seeds are always very marked. The Society thus did not have any difficulty in withdrawing from circulation and cultivation the products of *Princess* barley in Champagne, but the same barley succeeded so well in Indre that certain farmers managed to sell their crops as seed under another name and without submitting to a control which is very severe. Maltsters who buy in that district recognize *Princess* at first sight, and the workmen who receive the bags or attend to the steeping have no difficulty in separating it from other barleys. It is very interesting from a general as well as from a practical point of view to learn that *Princess* barley has not yet shown, after ten years of acclimatisation in a suitable district, any change in morphological and physiological characters, any degeneration or decrease in yield or in extract for the brewery.

Such is not always the case and this is the very reason of the compulsory yearly control to which the seeds of the Society must be submitted. Thus *ChevalierII* of Svalöf, which gave an average of good results, after eight years no longer deserved its name without a renewal of the seed. I have even been able to discover a very unexpected fact, which is of the greatest interest in the question of the fixity of hybrids. *Svanhals* barley, fixed and controlled at Svalöf, grown in Somme gave in two successive years segregations revealing its hybrid origin. This pedigree variety is recessive as to the character of the presence of spines on the flowering glumes; in Sweden it is stable and with smooth glumes, while if grown on the dry and calcareons hill slopes of Picardy it gives a high percentage of grains with spines. The ears of this variety offer even a mosaic of smooth and spiny grains, which has led me to the discovery of "mosaic heredity" (1908 to 1912).

As soon as the Society for Promoting the Cultivation of Malting Barley in France became acquainted with this result in 1906 it had *Svanhals* barley withdrawn from the trade and from further tests, although it is a highly recommendable variety and much esteemed in the North of Europe. Similarly at Svalöf, but for other reasons, *Hvitling White Probsteier* and some other oats, which had a great success towards the end of last century, are no longer produced. According to M. Nilsson-Ehle *Grenadier* wheat is also doomed to disappear shortly. It will be said that this mode of proceeding has long been known, that it has been adopted by all firms dealing in cereal seeds. Certainly, but the facts that *Hvitling* oats are so easily and surely recognized and that Svalöf alone is qualified to sell them with guarantee, render it possible to withdraw this cereal from the market and to replace it rapidly by another more suitable pedigree variety.

The following is another very important advantage obtained: it is well known that agricultural centres are periodically threatened by epidemics, mostly fungoid diseases, which cause enormous losses. The present general conviction is that the majority of these diseases are to a great extent spread by the use of infected seed. The introduction of pedigree seed must largely limit the danger of the spread of disease by the simple fact that very severe observations extending over a long time are necessary for their preparation. I have been able, in preparing native varieties for Champagne, to eliminate some very interesting pedigrees which were much less resistant to smut (*Ustilago*) than other pedigrees of the same origin. The very dry year 1911 rendered a great service in revealing which pedigrees were weakest from this point of view.

But the resistace to fungoid diseases, to cold, and to lodging is a function of the climate and soil; it is therefore to be feared that some kinds of pedigrees, transferred to a distance from the locality in which they have been studied, may become diseased or allow the germs of disease which they carry to become apparent. The increasing control at every generation of pedigree varieties reveals the danger and permits its avoidance. It is not more difficult for the societies that buy and sell pedigree seeds to withdraw from circulation the product of a few acres of rusty wheat than it is to suppress in Picardy *Svanhals* barley, which there does not preserve the morphological characters which allow of the yearly control as to its purity.

The method of the preparation and diffusion of the varieties of pedigree cereals devised at Svalöf, and practised in Sweden and in France, allows the most important problems of modern agriculture to be solved. The increase of yield, the greater value of the product guaranteed to the industries that use it, the security of purchases and sales, the protection against diseases, are the principal, though not the only, advantages that French agriculture will reap from the use of pedigree seed, controlled at each generation.

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The State of Agricultural Plant Breeding in Austria

by

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The improvement of plants most commonly grown in farms commenced in the seventies. As in Germany, a few farmers started the movement and their work awoke interest in the subject.

A theory of the improvement of plants developed later. It began in Austria with von Proskowetz. In 1892 the first lecture in Austria on the improvement of agricultural plants was delivered by Fruwirth at the Higher School of Agriculture in Vienna and in 1900 the first publication of the theoretical bases and technique of general plant improvement was made in "Die Züchtung der Landwirtschaftlichen Kulturpflanzen" (Fruwirth).

Special plant improvement was developed later. At present Austria possesses two independent chairs for the teaching of plant improvement, one in Vienna at the Higher School of Agriculture (v. Tschermak), the other at Felschen-Liebwerd (Freudl).

Side by side with independent work in plant improvement carried out by individual farmers, work was also commenced in Germany by public institutions in conjunction with private individuals, mostly peasant farmers. Such cooperation was started in Bavaria by Kraus and in Austria in 1902 by v. Weinzierl at the Seed Control Station in Vienna.

The further development by Austrian investigators of the theory of the improvement of plants need not be discussed here; it is, however, worthy of note that an Austrian, v. Tschermak, took part in the rediscovery of the results of the researches of the monk of Brünn, Gregor Mendel, which have acquired such great importance in connection with the laws of heredity. In the review of the present state of plant improvement, which is the object of this paper, improvement by private persons will first be dealt with and then that by, or together with, public institutions.

The last publication on the improvement of plants in Austria was made in 1896 (1). As there was not then any so-called national plant breeding (Landespflanzenzucht) it limited itself to a description of the breeding farms of independent farmers. The names of one breeder of rye, one of barley, one of oats, five of potatoes and seven of sugar-beets are given. To these should be added v. Zelenski of Gradkowice and F. Nolč of Ober Počernič in Bohemia not mentioned there; v. Zelenski began in Galicia in 1822 to improve Galician bearded wheat and Polish rye, which spread widely in Galicia. Nolč began his work of improvement with barley and potatoes in 1887, but the results of his activity which were already then much esteemed, were not known in wider circles till later.

Of the 17 above-mentioned breeders, only six still continue to work. They are: v. Proskowetz at Kwaffitz, improvement of barley, sugar-beets and lately rye; Wohanka & Co., Prague, sugar-beets and, recently, mangolds; Dolkowski at Nowawies near Kenty, potatoes; Zapotil at Vetrusic, sugar-beets; Nolč at Ober-Počernič, barley and potatoes; v. Zelenski of Gradkowice, wheat and rye; and Hennings now at Herrenleis near Ladendorf, potatoes. The selection of sugar-beets has attained special importance for the supply of the home market, which however still takes up large quantities of seed raised in Germany.

The improvement of barley was the first to spread the reputation of Austrian plant breeding. The Hanna barley of v. Proskowetz, even when still simpler methods of selection were used than those at present employed, was much appreciated throughout Central Europe.

Another production that very soon obtained recognition abroad was that of the improved potatoes of Dolkowski of Nowawies. Besides Hanna barley, Nolč's improved barley was also much esteemed and like the former found its way to Hungary, Germany and France.

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(1) *Landwirtschaftliche Pflanzenzüchtung und ihre Stätten in Oesterreich*. Leipzig and Vienna, Deuticke, 1896. (*Author's note*).

Since 1896 several breeding stations have been added to those mentioned above. Two of the new ones, devoted to the production and exportation of large quantities of seed, are specially important: the Central Establishment of the Nolč and v. Dreger Breeding Association at Chlumetz, and the Seed-Producing Farm at Loosdorf in Lower Austria. The former disposes of the original seeds of v. Lochow's and Strube's growth and of its own raising: Early Imperial, Bohemia and Earliest of All, Dreger's Bohemian Red Wheat and Dreger's Bearded Spring Wheat. The breeding of barley is carried out by Nolč at Ober Počernič, that of wheat by v. Dreger at Chlumetz. The seed farm at Loosdorf, which began breeding in 1903, is under the management of Director Schreyvogl and produces at present, besides wheats (Loosdorfer Red Bearded Winter Sb and Spring Sa), Lea, March and Thaya barleys, as well as oats and rye. It has also commenced with mangolds.

Besides these breeding establishments, several others work independently in Bohemia and Galicia. In Bohemia the Imperial and Royal domain of Jenc breeds wheat, Prince Schwarzenberg's estate Protivin since 1904 produces especially Bohemian wheat and also Bohemian rye and Probstei barley, Jiva at Vratno raises mangolds, and the seed-breeding company Pardubitz since 1906 produces sugar-beets. Dr. Holy, at Stepanovic, has included in the field of his activity the production of grasses which until then had been completely neglected in Central Europe. In Galicia, Count Scipio, at Lopuszka, has been engaged since 1900 in the first place with Galician wheat, of which two forms are bred, one bearded and the other beardless; then with Sandomierska, a local variety from Russian Poland. Two of his crosses endeavour to unite the good qualities of Galician wheat with those of Squarehead. In the same year breeding was begum at Mikulics. The landowner v. Dobczyc, at Turnau, has also bred several forms, from Galician wheat bearded and beardless, and two crosses of Galician wheat and Squarehead: Lozinka and Binlka, besides rye, oats and four-rowed winter barley. Buszczynski and Lazynski, a Russian firm, has been breeding sugar beets since 1886 at Niemiercze in Podolia and since 1905 also at Gorka Narodowa in Galicia. Three types, each for different conditions, are bred.

Breeding in connection with public institutions, so-called local plant breeding (Landespflanzenzucht), was begun first in Lower Austria. The director of the Seed Control Station in Vienna, v. Weinzierl, had already in 1887 attempted to obtain an improvement of the conditions of the production of seeds. The foundation of establishments for the cultivation of cereal seeds-corresponding to what are now called seed farms, was contemplated. The institution, however, had not fully satisfied its originator, and in 1902 a section for plant improvement (Inspector Pammer, Assistant Freudl) was added to the Seed Control Station. It commenced the breeding of plants of the locality on the technical lines of Neglisch of Dresden. In 1904 breeding was carried on in 10 centres, which by 1912, had become 12 mostly connected with large estates. Since 1910 all three sections of the

Seed Control Station have carried on breeding; to the raising of cereals the breeding of forage plants and of potatoes and maize have been added.

Cooperation with public institutions for the improvement of the plants of the country is practised in Upper Austria, Bohemia, Styria, Moravia and Galicia.

In upper Austria the former president of the Agricultural Society, Herr Wieninger, took the greatest interest in plant improvement and arranged his farm at Otterbach as a breeding farm. It was a kind of central station for Upper Austria; it produced several cereals, seed of which was mostly distributed to peasant farmers. The owner subsequently gave up the work. Four large farms have partly independently and partly in connection with Otterbach begun to breed: v. Boschan's farm at Achleitin was the first to engage in the work.

Carinthia possesses since 1911 a breeding garden at Maria Saal, founded by the Provincial Agricultural Council.

In Bohemia the cooperation of public institutions of the Province commenced in 1911. In connection with the German section of the Provincial Agricultural Council, the chair of plant breeding of the Tetschen Liebwerd Academy (Prof. Freudl) undertook the advisorship of three breeding farms: Postelberg (Prince Schwartzenberg) for wheat that may be sown in spring or autumn, and Hanna barley (since 1907), and two farms subventioned by the Provincial Agricultural Council: Friedland (since 1906) for local rye, and Duppau for oats (since 1909). In two of these, namely Friedland and Duppau, which are connected with peasant proprietors, the work of selection also has been undertaken by the above chair. In 1912 a fourth breeding station similarly subventioned was added to the list: Saaz, for barley. The advisorship of another breeding farm in Bohemia: Oberstankau (Schreiner), for rye and oats of the country, has been undertaken since 1907 by the 1st section of the Vienna Seed Control Station (Pammer).

The Czech section of the Provincial Agricultural Council began in 1904 to turn its attention to plant breeding. Wheat, rye, oats and barley were each to have had a medium-sized farm provided with all the necessary outfit and with technical direction. Of such stations only the Loncovà farm is still engaged upon oats. After several changes the improvement of wheat was undertaken by Prof. Jellinek, of Prague, that of rye by Director Babanel, of the School of Agriculture at Rokytzan; Prof. Munzar, nominated by the Provincial Agricultural Council to the post of director of the improvement of the plants of the province, took over the institution for the improvement of forage plants which had been founded in 1909 at Tabor by the Provincial Agricultural Council.

Styria has since 1908 adopted the cooperation of public institutions somewhat differently. At the Agricultural School of Grottenhof there is a breeding garden under the direction of the Seed Control Station of Graz (Dr. Hotter) which gives its selected seed to the school farm for multiplication, whence it passes to recognized seed farms; these grow it and sell it by means of the agricultural association of the province. In 1911 two other breeding centres were istituted and placed under the same direction.

In Moravia the Czech section of the Provincial Agricultural Council has turned its attention to the breeding of Hanna barley. Already previously, at the suggestion of Prof. Macalik, an association had dealt with the breeding of this variety. The Provincial Agricultural Council has recognized, in a series of experiments which were commenced in 1901, that the Kwaffitz Hanna barley is the best, and arranges for it to be grown by 23 breeding stations in the province. At the agricultural school in Prerau, at the request of the Provincial Agricultural Council, the breeding of grasses has been begun by inspector Nevral. The German Moravian Agricultural Association deals with the breeding of Moravian mountain oats. The agricultural experiment station at Brünn, which under director Vanka dealt chiefly with the improvement of barley, now under director Spisar selects other plants also.

In Galicia plant breeding with the assistance of peasant farms has not been carried out. The agricultural association has entrusted the director at Dublany, Mieczynski, with the task of advising the breeders of the province.

The attempts to introduce national plant selection are recent, so that the effects of the supply of seed to the peasant farmers on the agriculture of the country can not yet be felt. The national plant selection, in so far as it is carried on with this cooperation of peasant owners, has mainly the task of working locally and for peasant owners. The preparation by peasant farmers of considerable quantities of uniform first-class original seed for the trade is rendered very difficult by the limited extent of their granaries and barns and conveniences for cleaning and selecting.

What can be attained by the so-called national plant breeding is the gradual supply to peasant neighbours of better seed than that used up to the present. In those cases in which public institutions work together with the owners of large estates, the latter differ from independent selection farms only in the fact that the former can avail themselves of the assistance of the technical experts of the public institutions.

The independent breeding farmers of Austria have hitherto sufficiently provided the home market with selected seed and have also gained a footing abroad. What would still be desirable is that the owners of large and medium farms that do not select their seeds should value selected seed more highly than they do at present. The improvement of seed can only attain far-reaching significance for the agriculture of the country when, besides the work of selection as such, the production of improved seed is correspondingly developed. At present great demands are made upon the seeds turned out by breeding establishments, which the breeder can only satisfy by the high condition of his fields, granaries and barns and through development of his mechanical arrangements for cleaning and grading seeds. In this respect also the large seed-breeding farms of the Austrian independent seed producers occupy a high position.

The majority of Austrian breeders have found since last year in the Austrian Association for Plant Selection a representative of their interests. This association, which considers the improvement of the technique of plant selection as one of its chief aims, has started a Breeder's Book, in which, after examination of the farm by a commission, the corresponding selections are entered. This provision is copied from the breeding register (Hochzuchtsregister) of the Deutsche Landwirtschafts Gesellschaft and is intended to protect the products of the plant breeder and to guarantee the purchaser that the work of improvement is properly carried out by the breeder.

Agricultural Plant Breeding in Germany at the Present Day

by

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The breeding of agricultural plants in Germany has reached its present high state of development without State, or official, assistance. Its success is entirely due to the initiative of individual far-sighted agriculturists who have recognized the importance of improving cultivated plants by means of selection, and the satisfactory results of their labours prove how much can be effected in this direction by means of self-help. It is only recently that the Government, in some States where small holdings are the rule, has made arrangements by which the small farmer may enjoy the advantages of the work done in plant breeding.

Plant breeding in Germany began in the first ten years of the nineteenth century with the improvement of the mangold. In the middle of the forties the threatened ruin of the potato industry caused by the potato blight led to the improvement of the potato, while that of the sugar-beet, though it had begun early in the century, was not practised to any extent until the middle of the nineteenth century. Cereal selection started latest of all, and, with the exception of a few isolated attempts, dates only from the middle of the sixties. Steiger (at Leutewitz) and v. Borries (at Eckendorf) may be regarded as the founders of mangold breeding in Germany, while the honour of being the first potato breeders falls to Elsner v. Gronow and Paulsen (at Nassengrund). Klein Wanzleben is the birth place of German sugar-beet breeding, and Wilhelm Rimpau of Schlanstedt may be regarded as the father of cereal breeding in Germany. With the development of the cultivation of sugar-beet and the consequent adoption of intensive agricultural methods, plant selection became of greater importance, for the existing varieties were unable to profit by the improved conditions of cultivation; indeed in the case of cereals the yields were actually reduced owing to the lodging caused by better cultivation. Although more productive varieties were imported from England, Denmark, France, etc., to meet the demand, they failed in many districts, showing clearly the importance of using properly acclimatized varieties, and very soon a few preliminary attempts were made to improve the new varieties by selection. These gradually extended and before long came to include most of the cultivated plants, though the improvement was unequel amongst the different species.

Mass-selection was adopted as the sole method of improving varieties and was applied to the reproductive organs: thus mangolds were selected by the shape of their seed glomerules; but later mass-selection was extended to the whole plant, and in the case of the mangold, to its dry matter and sugar content. This method of mass-selection, which is now no longer practised in plant-breeding, gave excellent results in the case of cereals, mangolds, and other plants, which have not been surpassed by more intensive and scientific methods and it is important to realize this fact in order to understand the first period of plant selection in Germany.

The new varieties produced at this time owe their existence, for the most part, to the isolation of certain types from amongst the old native varieties or to the propagation of new types showing deviations from the parent type (*i.e* mutations), which deviations, being hereditary, facilitated the work of selection.

Modern selection of agricultural plants in Germany is based on the choice of individual whole plants, due regard being paid to all their important qualities. Such selected plants are grown and propagated separately, and their breeding value is judged by their offspring. The real selection, therefore, is based on the plant's reproductive capacity; it is the capacity of the plant to produce good offspring which is called into question, and its appearance and exterior only serve as indices in selection until such a moment as its worth is proved by the quality of its descendants. Working in this manner the best pure lines are obtained where the plants are self-fertilizing (Johannsen), while in the case of cross-fertilized varieties a superior strain or a good family may be obtained by crossing similar plants and subsequently selecting the best individuals. A rigid selection must continually be practised, and in doing this, it must be borne in mind that cross-fertilized plants exhibit a considerable variability and even though the chief characteristics of the pure lines taken as a whole remain unchanged, nevertheless, even here, differences occur and may lead to modifications, either favourable or the reverse, which therefore should either be used to improve the variety, or eradicated to preserve the purity of the strain. As such deviations cannot always be detected from the external appearance, the testing of the offspring of the selected individuals cannot be entirely neglected, even though it be not necessary to practise it regularly.

The continual selection of the best ("Deutsches Auslesenverfahren" Fruwirth) which the breeder formerly believed to be necessary in order to increase the productiveness of his variety, and which it was incumbent upon him to observe so long as he worked with mixed lines, is still useful.

The test of productiveness, as a rule, begins in the experimental breeding plot, where the descendants of the best plants are grown in equal and, if possible, large numbers in adjoining rows and under similar conditions. The offspring which prove to be weak, little resistant, or in any other way undesirable, are weeded out, the rest being further tested in the field in order to obtain as soon as possible an exact knowledge as to their cropping powers and other important economic qualities. The practice of judging individual plants by points given for as large a number of characteristics as possible, is being superseded by the systematic testing of their descendants in the field. The former system served only to supply a basis for later comparisons and to avoid the necessity of detailed entries in the plant register. Much of the testing apparatus which was formerly considered indispensable, and in any case served to adorn the plant-breeders' laboratory, is now seldom used.

There are countless records of the success in *sugar-beet breeding* and the fame of this work has spread far beyond the borders of Germany itself; by its means a high yield and a high sugar content have been combined, and beets have been obtained which are remarkable for their hardiness and other useful qualities.

In *mangold breeding* the varieties combining a large yield and a high content of dry matter have been rather left behind by those which have been bred either for large yield alone (Eckendorf and numerous other varieties) or solely for a high dry matter content (Lanker, etc). The combination of both qualities in a high degree has not yet been attained, though both have been remarkably developed in separate varieties. Mangolds with a high content of dry matter are valued chiefly for their superior keeping quality, and are therefore grown to supply the demand in spring, while those varieties which produce the large yield and whose keeping qualities only enable them to be used during the winter form the main part of the crop.

Cereal breeding is very widely distributed, owing to the large acreage usually under these crops. Numerous new varieties of all cereals have been created, partly by selection from foreign varieties adapted to the local conditions, and partly by working on indigenous varieties. Great success has been met with by breeders of wheat, barley and oats, but these have been surpassed by the performances of F. v. Lochow with rye at Petkus. We have cereals of all kinds suitable for the very varying climatic and soil conditions of Germany. Some are hardy and resistant, bearing fair crops under unfavourable circumstances, others are very productive but more exacting, whilst others again are mediocre as regards their yield and moderate in their requirements. This specialization has greatly increased the cereal crops and made them more certain, and its importance is in no wise lessened by the fact that some individual varieties can be successfully cultivated under many different conditions.

A special position is occupied by *potato breeding*. The new varieties of the potato which are placed on the market exceed in number all the other productions of agricultural plant breeding. The success of many of these new varieties is, however, but short-lived, relatively few of them being of any real worth; there are, nevertheless, sufficient of the latter to supply the demand. The German potato-breeder has certainly done great service to agriculture; by his exertions the old varieties, which had deteriorated in productiveness and general hardiness have been superseded by new kinds which in many cases have proved of the greatest agricultural importance. This success has, almost without exception, been the result of crossing, and it is only quite recently that new varieties have been created by selecting the modified forms arising amongst old varieties, as in the method adopted by Lochow at Petkus. Whether the satisfactory result of this practice is due to an unusual prevalence of bud-variation, or is to be attributed to other causes, cannot at present be determined.

Very satisfactory results have also been obtained in breeding Leguminosae; new and excellent varieties of peas and beans especially have been produced, occasionally by hybridization but more often by the use of mutants. Attention has also been paid now and again to the improvement and creation of new varieties of other members of the order, *e. g.* lupins.

The selective improvement of forage plants (clovers and grasses) is still in its infancy, but the attempts, which have been made in this direction through the isolation of types are so promising that there is no doubt this work will soon be crowned with success, in spite of the technical difficulties which impede it.

Little worth notice has been effected in the breeding of other agricultural plants; in not a few cases (French beans, carrots, cabbages, etc.) gardeners have so long occupied themselves with their improvement that there is little cause for the agriculturist to concern himself with the matter. It should, however, be mentioned that the breding of vines has advanced from the theoretical to the practical stage.

A good idea of the condition of plant breeding in Germany, in so far as the number of breeders is concerned, can be gathered from the review written by Dr. Hillmann at the request of the *Deutsche Landwirtschafts-Gesellschaft* (German Agricultural Society) and entitled "Die deutsche Pflanzenzucht" (Works of the D. L. G., No. 168). According to this there were in 1910: 34 breeders of winter rye, 3 of spring rye, 61 of winter wheat, 23 of spring wheat, 5 of winter barley, 60 of spring barley, 53 of oats, 23 of mangolds, 31 of sugar-beets, 17 of potatoes, 4 of cabbages, feeding carrots, etc., 8 of clovers and grasses and 28 of pulse. Although these figures can lay no claim to absolute accuracy, yet they give some idea of the extent of plant-breeding activity in German agricultural circles, and reflect the relative importance of the different classes of agricultural plants.

We have already mentioned before reasons for the limited extent of selection carried on amongst clover and grasses, but a few breeders could soon supply the country's needs as regards the improvement of many of these forage plants (*e. g.* grasses).

If plant selection has reached its present eminence in Germany without State aid, the fact must not be overlooked that its success and far-reaching utility are largely due to the effectual assistance of the *Deutsche Landwirtschafts-Gesellschaft.* The service which the latter has done to plant-breeding in Germany is by no means lessened by the fact that later, other agricultural corporations, unions, and associations (*Gesellschaft zur Förderung Deutscher Pflanzenzucht, Bund der Landwirte, Landwirtschaftskammern*) have worked on the same, or similar lines, for the first-named association took the lead in systematic and successful work in this field of labour. By its comparative field tests in all parts of Germany, the D. L. G. has, above all, contributed to elucidate the question of varieties, and to propagate the most valuable of these. Recently this branch of the work has been placed on a broader basis by the extension of the area for agricultural experiments through the intervention of the Chambers of Agriculture and by the establishment of smaller testing stations, mostly under the direction of scientific institutes, where the new varieties may be submitted to a preliminary sorting before proceeding to the larger field trials. These field trials of the D. L. G. have, for a long time, been supplemented by the potato-growing experiments of the *Deutschen Kartoffelkulturstation* and the barley-growing experiments of the *Versuchs- u. Lehranstalt für Brauerei* in Berlin.

Competitions for plant-breeding farms and associations have already been held ten times by the D. L. G., and have done much to promote, encourage and explain the work of selection, while the publication of the judgments passed on the various competitors has helped to distribute clear ideas as to the value of the methods and operations practised by different breeders. These competitions, which became increasingly difficult to organise as the number of breeding establishments grew larger, have been surperseded by the institution of the D. L. G. *Hochzuchtregister für Pflanzenzüchtungen* (Plant-breeding Register of the D. L. G.), in which can be entered the products of systematic breeding obtained within the German Empire. By "hochzucht" is meant the product of many years' systematic selection by one breeder or breeders' association, working according to a common plan, the pedigree and performance of which product is known from a plant register or from some other breeding document.

Systematic selection consists in the selection of individuals, either *per se* or in connection with known crosses, and is based on the utilization of the continual variability of types. Every variety entered on the Hochzucht-register must have a certain agricultural value based upon reliable variety trials. The entry is valid for 4 years, after which the variety must be reported and inspected in order to receive another certificate of eligibility. Being entered in the register entitles the variety to a patented label inscribed with "*Eingetragene D. L. G. Hochzucht*", which is a guarantee of its pedigree value. At present, the following are registered in the *Hochzuchtregister:* 6 varieties of rye, 9 of wheat, 7 of barley, 6 of oats, 2 of peas, 1 of field beans, 4 of potatoes, 6 of mangolds and 2 of sugar-beets.

All these regulations of the D. L. G. are made in the interests of the breeders or of the agriculturists, who obtain their seed from the former. The Inspection of Seed Production, established in 1897, is of the greatest use to those farmers who use ordinary trade seed. This institution undertakes the examination of the condition of fields growing seed for the market, and of the arrangements made for cleaning the seed, in order to determine whether the farm is capable of growing good seed, and especially whether the crops in the fields are pure-bred and of one single variety, as well as uniform and free from contagious diseases and dangerous weeds. The cleaning and grading of the seed is therefore controlled by the purchaser, and recognised seed offers the buyer every security with regard to such properties as cannot be distinguished by inspection: further, the pedigree, the number of resowings from the original seed, the freedom from cross-pollination, etc., are also under control. This practice of inspection is in force now in the districts where there are chambers of agriculture or similar organizations; it is carried out either by these bodies themselves or, more usually, by special *associations*.

The character of the undertakings varies; their chief aim is to promote the production of seed of varieties suitable to the district and the adaptation of these varieties to local conditions; the results obtained vary according to the manner in which the associations are managed; they have been especially successful where practical assistance has been obtained from scientific institutes or experts. As a model may be cited the organisation in Bavaria, where all seed-producing associations are in close connection with the *Kgl. Bairischen Saatzuchtanstalt* at Weihenstephan and are, so to speak, under its direction. A similar state of affairs occurs in Württemberg and in Baden where there are also State institutes for plant breeding: the *Kgl. Württembergische Saatzuchtanstalt* at Hohenhein and the *Grossherzogl. Badensche Saatzuchtanstalt* at Hochburg, which encourage seed selection by their own work together with the assistance of local organizations. In other parts of Germany, no institutes for the special purpose of plant breeding have yet been established. Here, almost without exception, the experimental and teaching institutes have included the selection of agricultural plants in their sphere of operations, thus taking the place of the State Institutes of Southern Germany. As the Agricultural Universities and Colleges instruct their students in plant breeding, both theoretical and practical, and in some places, *e. g.* at Jena, by submitting them to a seed inspector's examination give them an opportunity of proving that they are conversant with the principles of agricultural plant selection, the effect of such institutions upon the development of this industry is in no way to be despised. Moreover experience has proved that the decentralization of the work in this direction has great advantages. Certainly it is most desirable that some well-equipped experimental stations should be founded for the purpose of working out the principles of heredity, a clear understanding of which is of fundamental importance in practical plant breeding, for such problems can only be mastered by dint of systematic investigations requiring much labour and time, although individual effort can add its quota to the general sum of knowledge. The *Gesellschaft zur Förderung Deutscher Pflanzenzucht*, founded in 1908, exerts a considerable influence on the development of plant breeding. This society includes amongst its members practical breeders and the exponents of the different sciences connected with plant breeding. It has successfully extended agricultural plant selection by means of various experiments and forwarded the interests of the breeders.

Thus a lively and increasing interest in the various branches of plant selection is apparent in all agricultural circles in Germany, and the results of the breeders' work receive the keenest appreciation amongst farmers, who readily turn to account the discoveries made by the experts. As a result, agricultural returns have increased and become steadier; but it is impossible to demonstrate this fact by statistics, as cultural methods have also contributed to the result. The more the success of plant selection can be made known to the peasant agriculturists, the greater will be its beneficial effect upon agriculture in Germany.

Present State of Forestry in Portugal

by

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Forest Legislation. — The law of December 24, 1901, and its Regulations of December 24, 1903, mark an important step in the progress of forestry in Portugal, in virtue of the following measures:

Establishment of the principle that the receipts from the State forest are to form a special fund devoted exclusively to the cultivation, and working of the same forests and to reafforestation, leaving the State to pay the staff of the forest service.

Placing under the control of the forest service all the forests belonging to the communes, parishes and public establishments, as well as all the uncultivated lands which cannot be economically cultivated and the reafforestation of which is recognized to be of public utility.

Obliging all landowners who possess lands and forests within the afforestation area declared to be of public utility, to submit to the control of the forest service under penalty of expropriation.

Permission granted to landowners whose properties are not included in the reafforestation areas to submit *partially* to the forest service or only to the forest police service (1).

Institution of a bureau for the management of forests and for research and experimentation in forestry.

The above law is followed up by the law of May 23, 1911, which fixes at 150 reis (about 7 ½ *d*) per ton, the tax on the exportation of props for mines, and provides that 70 per cent. of the yield of this tax be allotted to the special fund of the Forest and Waters Department, at the same time obliging the latter to grant yearly prizes to those teachers of primary schools who have distinguished themselves in the teaching of forestry or in organizing school or mutual forest associations.

Lastly, the recent organisation of the agricultural service of August 17, 1912, is to be mentioned. It divides the country into agricultural districts and forest belts and creates in each district an agricultural station entrusted with the study of the local agricultural contidions, the establishment of experiment fields and of alpine gardens and the spread of instruction by object lessons. In each of these stations the agents of the Forest and Waters Service play an important part.

Direct action of the State — The provisions of the law of 1901 have had an immediate effect upon the forest services of the State. The Department of Forests and Waters, on the strength of a guaranteed fixed annual budget, independent of parliamentary votes, has been able, since 1903, after deduction of the expenses required for the cultivation and exploitation of the State forests, to devote its revenues to the reafforestation of the dunes and mountains, as well as to the improvement of waste lands and moors which the communes, through want of funds, cannot reafforest.

The result has been the yearly reafforestation by the State of nearly 1750 acres of waste lands situated on the mountains and on the shifting sands of the coast, since the mission of the State is generally to undertake the most onerous work.

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(1) The law establishes the obligatory control by the forest service and the optional submission to the same. The control is obligatory for the State forests, for those of public bodies and even for those of private owners when they are situated within the areas of afforestation declared to be of public utility. It is optional for all private forests not situated in the above areas.

The control of the forest service is complete for the State forests, and partial for those belonging to communes and parishes and for private properties included in reafforestation areas.

It is either partial or a simple forest police service for those estates which the owners voluntarily submit to forest control.

The two first, total and partial, differ from each other in the object aimed at by the systems of management, which are always submitted to the approval of the State.

The simple forest police control is less strict; it barely obliges the owner to preserve his forests and to reafforest his uncultivated land in a generally sufficiently long period, without determining the extent to be reafforested every year.

The advantages offered by the State to private owners submitting to partial control are naturally greater than those offered to the owners who submit only to the simple forest police control. (*Author's note*).

This constant average will increase from the year 1913, thanks to the supplement of revenue which the export duty on mine props will yield to the Department of Forests and Waters. Nevertheless it must not be forgotten that the yearly increase of the area of the forest domain entails greater outlay for planting and surveillance, and consequently the increase of the extent benefited cannot be strictly proportional to the increase of revenue.

The institution of a Bureau for forest management, research and experimentation, allowing of greater uniformity in these studies, marks a great progress from the point of view of scientific research and of the exploitation of State forests. The results of these investigations and observations are always slow in the matter of forestry; still, it is confidently believed that in one of the next forestry congresses Portugal will be able to present important studies on the maritime pine, its growth and conditions of cultivation and on the acclimatisation of exotic trees, following the instructions adopted by the International Union of Forest Research.

Indirect action of the State. — The indirect action of the State, which is an immediate consequence of the existing laws, takes the following forms: Supply of ornamental trees to municipalities for avenues and public parks and squares, and of forest trees to communes and landowners whose estates are under partial forest control and who may avail themselves of the services of forest officials for reafforestation and exploitation work. Landowners whose lands or woods are not comprized in the reafforestation area are allowed to submit them to the partial forest control or to the forest police service on presentation of the plans of their holdings, which plans may be made, at their request, by the forest officials. Landowners have besides the right of reserving their shooting and fishing rights and of keeping at their own expense duly sworn forest-guards appointed by the State, without being obliged to prosecute evil-doers, which is done by the State ; reafforested lands are exempted from the payment of taxes for twenty years, and rewards are given to teachers of primary schools who in the course of the year, have deserved well of the forests of the country.

Action of the Communes and of public institutions. — Not much can be expected from the direct action of the communes, all of which are more or less short of financial resources with which to meet the expense of reafforestation. In general, and with but few exceptions, most of their landed property, which may be estimated at about five million acres, is neither cultivated nor wooded, notwithstanding the fact that from the very first years of the existence of the kingdom of Portugal, Royal Orders were incessantly issued with the object of preserving the forests and ensuring reafforestation of waste lands. Nothing has been able to prevent deforestation, due to the woodman's axe, excessive grazing and the forest fires caused by shepherds.

Only a very few communes or public bodies have been in a position since 1904 to include in their budgets the sums required for reafforestation. On the other hand the number of communes which every year requests the State to undertake the work is constantly increasing. This has been provided for by the law which admits the following arrangements being made:

As soon as the submission of communal lands or forests to forest control has been approved by decree, as well as the plan of reafforestation or of management, the municipalities must declare within 30 days from the publication of the decrees in the Official Gazette which process of reafforestation they prefer and which may be one of the following:

1. Reafforestation and management carried out by the Forest Service at the expense of the State, the municipalities having the right to a part of the net returns.

2. Reafforestation and management carried out at the expense of the municipalities which alone enjoy the returns.

3. Reafforestation and management carried out jointly by the State and by the municipality.

Without entering into details, it will be sufficient to say that for the adoption of the first process it is indispensable that the municipalities prove that they do not dispose of the funds required to meet the cost of reafforestation; in this case the division of the net returns between the State and the municipality is made proportionally to the value of the communal land before its improvement and to the outlay of the State for reafforestation, the salaries of the officials not included.

Private enterprise. — The above-mentioned law has been generally well received by the owners of woods and of lands to be reafforested. Of all the advantages offered by the law, and which have been enumerated above under the heading "Indirect action of the State", those which have been most welcome are the right of shooting over the property and the protection against poachers and other marauders, for owing to want of means, the municipalities have never established a properly organized rural police, which in fact it may be said does not exist in the country.

Statistics show that since 1904 (the Regulation of the law of 1901 was not approved until December 24, 1903) the acreage of holdings submitted to forest control is already considerable: that the communal and private property submitted to partial forest control is 74 550 acres, and the private property submitted to forest police control is 259 000 acres.

The enormous difference between the acreage of private property submitted to partial forest control and that submitted to the simple police control shows that the legislators, well knowing the aversion that landowners entertain against contributing a yearly fixed sum for the purpose of carrying out plans of reafforestation or management, both duly approved by decree, have wished to lead them to engage themselves voluntarily, in consideration of certain advantages, to the conservation of their woodlands and to the reafforestation of their waste lands within a period of time fixed somewhat *ad lib.* As this is only allowed in the optional forest control, the results show that the legislators were right, in as much as they remembered that he who wants everything ends by getting nothing.

Progress of forestry. — We must not confine ourselves only to the study of the yearly increase of the forest domain of the State and of the communal or private properties under forest control, in order to ascertain — in default of other statistical data — to what extent the wooded area of the country increases. There is also an indirect way and a very important one, namely that of the trade in the seeds of maritime pine, the applications for which addressed to the Department of Forests and Waters increase yearly in importance, while traders, in view of the greater demand for this seed, have doubled their prices.

Having no other trustworthy data beyond those which can be drawn from the applications addressed to the State, we can state that the latter has supplied this year enough seed to reafforest about 7400 acres of waste land, considering that with few ecceptions the regeneration of maritine pine forests takes place naturally even after clean felling.

Besides this important fact, it is also a matter of rejoicing that this year, on March 9, Arbor Day has been celebrated with enthusiasm by the municipalities and the teachers of primary schools, who, in the villages, have most contributed to its success. Lastly, especial mention must by made of the Association of the Lovers of Trees, which owing to the great number of its members is destined to play a great part in the forest policy of the country, as has been the case with similar associations in other countries.

Causes of reafforestation. — It would be a mistake to attribute all the merit of the movement which has set in in favour of reafforestation to the better comprehension of its utility, to the propaganda which has been carried on in its favour and to the action of the State. It is necessary also to seek the economic causes which have been at work. They are the enhanced value of forest products, the increased mileage of our railways and roads, the greater demands of trade and of the industries : the greater value of cork, the exportation of mine props to England, the spread throughout the country of the resin industry. These are the principal factors which have increased the value of the maritime pine forests and have attracted to them the attention of capitalists.

This forest tree is always the one preferred. It is very robust, not exacting in its cultivation, soil or aspect, thriving up to 2700 feet and reaching up to 4000 feet; it is of great value owing to the facility with which all its products can be disposed of. Such is not yet the case with Eucalyptus, the exotic tree most widely spread in Portugal : of rapid growth, attaining enormous dimensions while still very young, thriving equally well in almost every kind of soil, still the various industries hesitate to use it because its wood warps and cracks in drying and consequently it does not sell easily. *Acacia melanoxylon*, on the contrary, though more exacting as to soil and aspect and less widely spread, develops also very rapidly and is very much appreciated for carpenter's work. Both these foreign trees shoot freely from the stool.

Forest wealth of the country. — The following forest species constitute the stands, which cover 19 per cent. of the total area of the country. They occupy the following acreage :

Marittime pine and umbrella pine, the former prevailing	1 909 663 acres
Evergreen oak	898 833 »
Cork oak	817 081 »
Chestnut.	210 345 »
Pedunculate oak, Pyrenean oak and Portugal oak.	169 150 »
	4 005 072 acres

Geographical distribution of the forest trees. — The valley of the Tagus, which roughly divides the country into two large agricultural regions, separates also the principal forest belts.

To the south of this river the vast region of the plains extends, in which the rains are less abundant and the climate warmer. That is the home of the oaks with evergreen foliage, which are met with on both banks of the river.

To the north is the mountainous region; its climate is not so dry, the rains being more abundant. In it maritime pine prevails, its area extending also on the left bank of the river, following its course as far as its mouth where it descends somewhat towards the south along the shores of the Atlantic. This region is also the habitat of chestnuts and of deciduous oaks. These also descend towards the south, but on the opposite side of the country along the Spanish frontier on the more broken ground and at the greatest altitude.

Methods of forestry. — From the cultural point of view there is nothing of great interest to be said. Green manuring and chemical fertilizers, which are already so extensively used in farming, have only been tried as experiments by the Forest Service.

The forests of maritime pine are cultivated as follows:

In the north, where property is much divided and agriculture intensive, and where the farmers use reeds as manure, the method of selection felling is the one that answers best to the requirements of the district. In the centre where the stands are denser, thinnings which are fairly well conducted are followed by clean felling in private forests when the trees are between 40 and 80 years old. In the neighbourhood of Lisbon and of the other large centres of population, selection felling is again met with in conjunction with pruning. The high prices that the branches provided with their needles fetch for baking purposes, are the cause of the choice of this method, which ensures owners a high fixed annual revenue.

Forests submitted to this system are generally divided into 4, 5 or at most 6 fellings, all of the same extent, of which one is worked every year, leaving the tops of the trees with barely 4 or 5 whorls.

When the trees are pruned, which is the chief object, selection lopping is practised, leaving aside those trees capable of producing building timber or those which are over shaded and fit only for fire wood, which commands a high price. The cover is thus kept fairly clear, so as to allow of spontaneous regeneration and of the free development of young branches.

The State forests properly managed, in view of their greater yield, are submitted to a rotation of 80 to 90 years.

The evergreen oak which elsewhere is mixed with cork oak, forms great stands, the wood and bark of which are not utilized. Its fruit supports numerous herds of swine which feed upon the acorns under its cover. It is calculated that 19 bushels of acorns of the evergreen oak are sufficient to fatten a pig, whilst it requires nearly 23 of cork oak acorns. The fattening of pigs is undoubtedly one of the principal resources of the country to the south of the Tagus.

The cork oak, the bark of which forms one of the most important branches of the export trade, is stripped of its cork every 9 to 10 years in the plains, and every 11 to 12 years on the mountain slopes.

These two oaks, the source of so much wealth and which are only fully exploited when they are sickly, are carefully tended and subjected to generally well-conducted pruning, which yields fire wood to the whole region of the south of Portugal where the growing of wheat prevails. Their reproduction is not obtained by replanting or by artificial sowing, ; it is left to nature and only protected by man.

Deciduous oaks are seldom seen as high forest, but mostly as coppice, and it is only mixed with other forest trees or standing isolated that some old oaks are to be met with. The coppices are cut at 10 to 12 years for tan bark and for charcoal.

Chestnuts are grown as coppice with a rotation of from 25 to 30 years. They produce wood for carpenter's work and highly esteemed staves; the chestnut shoots which are cut when the coppices are cleared furnish hoops for casks and strips for basket work, while the nuts are used as food for the people and for fattening pigs. Nevertheless chestnuts tend to disappear in Portugal, as in the rest of the Mediterranean countries.

During the last five or six years the Bureau of Forest Research has undertaken the study of the different methods of controlling the disease which destroys chestnut trees without apparent cause, and which it was believed at first would not have attacked woods situated at high altitudes.

Exotic plants. — A mild climate favoured by the neighbourhood of the Atlantic, favours the acclimatisation of trees of the two hemispheres.

In our parks under cover of the trees of the North of Europe and of America, under pines and Mexican araucarias, by the side of which the exuberant vegetation of eucalypti and *Acacia melanoxylon* may be admired, the tree ferns of the tropics and the palms of Africa are met with.

The Forest Department has been able to draw largely from abroad the plants required for reafforesting the highest summits of its mountain chains.

Silver fir, *Abies Pinsapo*, larch, Scotch pine, Corsican pine and birch will form the future woods at heights above 3300 feet which is the upper limit of the maritime pine, which however can be used as a forerunner up to 4000 ft. The pedunculate oak, the Pyrenean oak and the chestnut do not usually pass this limit in good conditions of growth.

Besides these forest trees the following might be mentioned as reproducing naturally in Portugal: *Sequoia sempervirens*, Douglas fir, *Cupressus glauca*, cedar of Lebanon, deodar, Atlas cedar, and the tan acacias (*A. mollissima, A. pycnantha, A. decurrens*).

Acclimatization of exotic plants. — The acclimatization of many exotic plants presents no difficulty in Portugal, as may be seen from the avenues of Lisbon in which *Cercis japonica, Sophora japonica*, Ailanthus, lime, mulberry and Indian lilac thrive. The public parks and gardens, as well as the national arboreta of Bussaco and Pena, are rich in specimens of trees of all climates.

Work of reafforestation to be carried out. — As has already been stated the area occupied by forests in Portugal corresponds to 10 per cent. of the total area of the country, taking into account the 1 715 914 acres covered by evergreen oaks.

But if it is remembered that the stands of evergreen and cork oak are not utilized for their production of wood, that the woods composed of other kinds of trees but rarely clothe the high plateaus and the tops of the mountains, an easy explanation will be found of the bareness of the latter and of the great importation of building timber.

The result is that without any doubt the area to be reafforested by the State, including the 89 000 acres of shifting sand-dunes, may be set down at about two and half million acres, unless private initiative steps in with its assistance. The accomplishment of this task, however, owing to limited resources of the budget and to the hostility of the inhabitants of the mountains, is still far off.

As for the final and economic success of the undertaking, the work that has already been done does not leave any room for doubt.

The thousands of acres of shifting dunes that have been fixed, the fine stands of pines and of native oak which clothe the slopes of the reafforested mountains, and those of exotic trees which already crown the highest summits, are a convincing proof.

Importation and exportation of forest produce. — A comparison between the returns for 1870 and 1910 shows clearly the progress achieved by forestry in Portugal during this period.

Importation	1870	1910
—	£	£
Heads, staves and hoops	76 524	168 389
Building and carpenters' timber	57 863	185 953
Cork	353	1 106
Various products	—	5 578
	134 740	361 026

Exportation	1870	1910
—	£	£
Building timber	32 357	206 682
Cork	143 901	992 319
Various products	12 291	34 000
	188 549	1 233 001

If the table of imports shows the progress of our forestry in 40 years, it shows also from a forestal point of view that we are short of oak wood, as well as of those woods required for carpenter's work and for the building of expensive houses.

On the other hand the table of exportations shows the development recently attained by the cultivation of maritime pine, which is exported principally to England, and of cork coak, which makes up, by itself, one of the chief branches of our forest wealth.

From the above, the conclusion to be drawn is that reafforestation has made considerable progress in Portugal since 1870, thanks to the increased value of forest produce and to the general economic development of the country.

But if at present a good many waste lands are yearly put under forest culture, it is no less true that an extensive field still remains open to the activity of the foresters of the furure.

Farm Management in the United States at the Present Time: the Actual Scope of its Work, and Recent Development therein

by

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As developed in the agricultural colleges and the national department of agriculture in the United States, farm management is that branch of agricultural science which deals with the business problems connected with farming. It is, in reality, a branch of applied economics. It may be logically divided into the following subdivisions :

1. A comparison of farming with other businesses as a means of earning a livelihood, including the advantages and disadvantages of the farm as a place of living compared with the city.
2. Preparation and training required for success in farming.
3. The method of securing a footing on the land.
4. The selection of the region in which to engage in the business of farming. This phase of the subject deals with the relation of geograhpy to agriculture, and includes a review of soil, climatic, economic, and ethnological conditions in the various farming regions.
5. Principles involved in choosing the individual farm within the region selected.
6. The selection of the enterprises (crops, live stock, etc.) which are to constitute the basis of the farm business. This involves a study of the geographic and economic relations of all the different agricultural enterprises.

7. Farm organization. This branch of the subject deals with the principles involved in fitting together suitable enterprises in such a way as to give the most desirable distribution of labor throughout the season, to secure minimum expense in equipment and management, to secure the maximum use of equipment and to provide employment for the capital available.

8. The character, quality, and cost of equipment required for the proper conduct of the organized farm.

9. The capital required and its distribution between the factors of production on the farm. This branch of the subject also deals with the cost of production on the farm and the profits to be obtained from various farm enteprises.

10. Farm operation. The subjects which are dealt with in this branch of farm management are systems of operation, such as operation by the proprietor and his family, operation by hired labor; managerial operation by tenants, either cash or share. Each of these systems of operation is dealt with from the standpoint of its advantges and disadvantages as a means of conducting a business. Another phase of farm operation which is an important subject in farm management is the character of the lease contract between landlord and tenant when the farm is operated on a tenant system. The principal phase of this subject, from the standpoint of farm management, is the division of the profits of the farm between labor and capital. The study of farm operation also includes the subject of farm records and accounts; the management of farm labour; the care and keep of equipment; the principles of marketing, etc.

Teaching Farm Management — Of the forty-eight State agricultural colleges in the United States, thirty-eight are now teaching the subject of farm management, and one other states, in reply to a circular letter, that the teaching of this subject will begin next year. Thirty-six of these institutions report a total of 2575 pupils in their farm management classes. One other states that the subject is taught to all seniors, and another states that it is taught to all students in the institution.

When it is considered that the teaching of farm management as a separate branch of agricultural science is comparatively new in this country, there being only two institutions in which classes were held in this subject six years ago, it is seen that farm management is rapidly making its way into the agricultural schools of the country. We have have had no satisfactory English textbooks heretofore. One good textbook has just recently become available, and another will probably be available before the beginning of the next school year. With these aids the subject will doubtless be introduced into all the agricultural schools of the country in the near future.

Farm Management Investigations. The United States Department of Agriculture is mainly an investigating institution. There is also in each of the forty-eight States of this country a State agricultural experiment station supported partly by funds from the national government and partly by State appropriations. The first of these institutions to begin strictly farm management investigations was the agricultural experiment station of Minnesota. These investigations began about a dozen years ago. Shortly after that the Office of Farm Management was organized in the Bureau of Plant Industry of the United States Department of Agriculture. Extensive investigations on the subjects outlined in the first section of this paper were begun in this new office. Since its organization investigation of farm management subjects has become quite general at the State experiment stations.

Following is a list of the more important subjects of investigation relating to farm management reported by the various State experiment stations : supervision of farms; records of labor and financial transactions on farms ; farm management surveys (see below) ; cost of operation ; cost of producing corn and wheat ; investigations of capital and equipment on home farms of students ; the economics of dairy farming ; farm home management ; the economics of stock management ; economic surveys of a State ; price paid farmers for produce and paid by consumers in various towns in a State; influence of absentee landlord upon crop rotations, methods of managment, and types of farming ; management of surplus farm help in winter ; use of farm teams to best advantage; systems of accounting ; distribution of labor on various crops ; comparative cost of production under humid conditions and under dry farming conditions ; most profitable rotation systems adapted to different sections ; relation of type of farming to profit ; economic study of the retail milk business ; cost of producing maple sugar and maple syrup ; marketing of farm products ; marketing of cheese ; land tenure ; history of agricultural production ; proper amount of farming on a given area of land.

The nature of most of the above investigations is sufficiently indicated in their titles. The farm management surveys, which are becoming one of the most important phases of farm management investigations in this country, need some elucidation. In this work groups of not less than six hundred farms are studied in sufficient detail to determine the labor income of the farmer. In these studies the gross income and the total expense of each farm are determined. The labour income is then calculated by deducting from the net income of the farm interest on the capital invested and the value of unpaid labor performed by the members of the farmer's family. What is left is considered to be the labor income of the farmer himself.

One result of these studies has been to indicate that on an average the income of the farmer is sufficient to maintain the farm and its equipment, pay interest on the investment, and ordinary wages to the farmer. It is thus seen that farming compares favourably with other industries in which there is free competition and in which production is limited only by demand.

It has been found that generally speaking the size of the farm is a very important element in profit. With many exceptions it has been found to be a general rule that the larger the farm the larger the labor income. In those sections of the country where the average farm is large and where the farmer uses large teams and large machinery, the labor income rises considerably above the average. On the other hand, in those sections where the farms are small and where the farmer uses small teams and implements, the average labor income is below the average for the country. It would be interesting to know whether these conditions hold in other countries than the United States.

Work of the Observatory of Phytopathology in Turin

by

Prof. PIERO VOGLINO,

Director of the Observatory.

With the object of enabling Piedmontese farmers to know the diseases that attack cultivated plants and the means of controlling them, the President of the Agricultural Association of Turin took the initiative of an Association for the institution of a district phytopathological observatory. The Ministry of Agriculture, the Savings Bank, the Municipality, the Charitable Foundation of St. Paul, and afterwards the Chamber of Commerce of Turin, answered the invitation. At a meeting of the representatives of the above bodies a Statute and Regulations were discussed and approved. In December 1908 the Council of Administration of the new Institution met under the presidency of Count Rebaudengo. The Observatory began to work regularly on January 1, 1909 under the name of " Osservatorio Consorziale di Fitopatologia " and with the aim of exerting a strict surveillance on the plants cultivated in the district, with the objects of: 1. informing the public every month of the appearance of harmful parasites and other dangers to plants, at the same time forwarding a list of them to the Ministry; 2. studying the causes of the diseases and pointing out in due time the best means of control; 3. spreading among farmers, by means of meetings, discussions and practical lessons, to be held in several localities, practical notions on plant diseases and their control; 4. instituting, with the farmers, experiment fields for the control of the more widely-spread plant diseases; 5. watching over, in respect to diseases and if requested by the Municipality, the public gardens and avenues of the city of Turin and applying, where advisable, the proper means of control; 6. examining suspicious mushrooms if requested to do so by the Bureau of Hygiene; 7. giving verbal or written consultations to farmers of the district and paying visits to the various localities; 8. attending to the institution of a special Museum of vegetable Pathology; 9, presenting in the first quarter of each year a comprehensive report on all the work done and the progress of the observatory during the preceding calendar year.

The institution was hailed with enthusiasm, but before the full utility of the Observatory could be established it was necessary to allow a certain period of time to elapse

The constant requests for visits, the abundance of material sent or brought for examination, the numerous consultations, and the frequent visits to the Museum, show the lively interest that farmers take in the institution and that they recognise the advantages they can reap from it. The Observatory has marked in Italy a considerable progress in the control against parasites. The real utility lies in the touch between the farmers and the pathologist, so that when the natural mistrust has worn off the tiller of the soil gains confidence in the man who gives him exact notions on the causes of the diseases which attack plants, and on the means of controlling them. The farmer knows that there is an institution directly responsible for the prevention of the spreading of plant diseases.

In every commune of the province of Turin, the Observatory has two, four or six local observers, who are selected from among the most willing farmers, under the guidance of a head local observer. They can easily point out the various diseases and communicate to their neighbours the practical advice sent out by the Observatory. In order to facilitate sending away specimens, in every commune there is a depot of special tin boxes.

Thus the local observers, who are upwards of 500, report carefully even the slightest signs of disease in plants, and forward abundant material; thanks to their assistance the Observatory was able to discover the causes of much mischief in the province of Turin and in several other parts of Piedmont. In the Bulletins, which are published monthly, and in which lists are drawn up of the various plant troubles reported together with the practical advice tendered, account is given of the following work: 1511 examinations of plants, 816 visits, 88 meetings, and a correspondence numbering 2405 letters, in 1910; in 1911 the examinations were 1537, the meetings 92; 850 farms were visited and 3083 letters written; in 1912: 1752 examinations, 973 visits, 85 meetings and 3220 letters.

There is a constant increase in the number of visitors to the Museum, in which a great number of specimens of the diseased plants that have already been investigated, and of the parasites which affect them are collected, and it is encouraging to see that the practical farmer examines with attention the various specimens which show the development of the parasitic plant pests and how he understands the necessity of certain methods of control.

The development of some fungi and insects hitherto imperfectly known has been followed not only by means of the specimens collected at different times and in several places, but also by microscopic examinations and by special laboratory cultures.

The Observatory, considering that its chief objects in view are investigations on the diseases of plants and their remedies and the practical application of the same, has conducted numerous experiments with various substances against the most injurious parasites, endeavouring always to render the treatment as simple as possible, considering the scarcity and high price of labour. Of the many specifics sent to the Observatory for recommendation, only those of which the composition was declared were taken into consideration, and handed over to expert farmers to be tested under the surveillance of the Observatory.

In order to popularize the use of remedies and cures the effect of which is certain against some widely spread diseases, every year communal competitions are held and special prizes are awarded by the Observatory, the Ministry of Agriculture, the Royal Academy of Agriculture of Turin, the Turin Agricultural Association (Comizio) and other bodies.

A brief sketch is here given of the principal scientific results obtained by the study of several fungus forms. In 1904 the following were specially observed: The presence of *Taphrina bullata* Bel. with organs of fructification on pears; the prolonged presence of large conidia of *Phyllactinia corylea* and the formation of epipectic hyphae of the perithecia; the development as a true parasite of *Phyllosticta maculiformis*, equal and even superior to that of the *Cylindrosporium castanicolum* form; a very remarkable development in length in the branches of hornbeam affected by *Melampsora Carpini* (Nees) Fuck.; the greater secretion and consequent formation of a greater number of cystids in the leaves of *Celtis australis* affected by *Gyroceras Celtidis* (Br.) M. et C., and abnormal development in the cellular tissue of the branches; three new species of fungi. The observations of 1905 embraced: The distinct parasitism of *Stereum frustulosum* and of *Daedalea quercina* on oak; the passage of *Phyllosticta prunicola* in hybernating form, on to the branches of plums; the very disastrous infection of *Gloeosporium Platani* = *Gl. nervisequum* caused by excessive humidity; the identity of *Pyricularia Oryzae*, of *P. parasitans* and of *Dactylaria parasitans* with *D. grisea*; the identity of *Cercospora hypophylla* with *C. Rosae-alpinae*; four species and two new forms.

In 1906 the following were observed: marked characters of *Peronospora* shown by *P. cubensis* with extraordinary development of the mycelium, and presence of haustoria in the epidermal cells of the leaves of cucumbers, as well as oospores in the leaf-tissue; parasitism of some species of *Pylyporus* and of *Collybia velutipes*; resemblance between *Phyllosticta Bolleana* and *P. Evonymi*; *Sphaerella hedericola*, ascophorous stage of *Septoria Hederae*; *S. Campanulae* = *S. Trachelii*; presence in Italy of *Dothichiza populea* Sacc. and its parasitism on *Populus canadensis*; reference of *Vermicularia trichella* and *V. circinans* to the genus *Colletotrichum*; *Marsonia Potentillae* = *Gloeosporium Fragariae*; two new forms: *Phyllosticta Ribis-rubri* and *Septoria Soldanellae* var. *pyrolaefolia*.

Notable are the results obtained in 1907, namely observations on: the marked parasitism of *Pythium* on the roots of *Centaurea*, the formation of conidiophores with conidia about the collar of the infected plant and of numerous oospores in the dead tissues; the parasitism of *Phragmonaevia laetissima*; reference to *Ascochyta hortorum* of *Phyllosticta hortorum*, *Phoma Solani*, *Ascochyta Lycopersici*, *A. socia*, *A. solanicola*, *A. Atropae*, *A. Alkekengi*, *A. pedemontana*; *Septoria Leucanthemi* parasite of cultivated species of *Leucanthemum* and *Pyrethrum*, with spores 100 to 130 μ in length and 4 to 5 μ wide, with 12 to 14 transverse septa; seven new forms: *Phyllosticta Balsaminae* parasite of *Balsamina*, *Pyrenochaeta Centaureae* on

Centaurea candidissima, *Septoria foetida* on *Datura Metel*, *S. longispora* on *Phlox Drummondi*, *S. Limmanthemi* on *Limnanthemum nymphoides*, *S. Aderholdi* on *Centaurea candidissima*, *Colletotrichum ampelinum* f. *ramicola* on vine canes.

From the study of fungus forms in 1908 it was observed that: *Oidium farinosum*=*Sphaerotheca pannosa; Gloeosporium Trifolii*=*G. caulivorum*= *Pseudopeziza Trifolii; Ascochyta contubernalis, A. pucciniophila* and *Phyllosticta pucciniophila* = *Darluca Filum;* presence of *Cytospora Celtidis, Colletotrichum Grossulariae, Alternaria Violae* and *Oidium quercinum* in Italy; two new forms of *Botrytis, viz* f. *Ocimi* and f. *Punicae*; four new species: *Phomopsis populina, Ascochyta Phlogis, A. Eriobotryae* and *Leptothyrium Paeoniae.*

In 1909, together with the parasites already noticed in the preceding years, some new forms were observed, namely: *Peronospora Viciae* widely spread in the mountains on the leaves of peas and of *Orobus vernus; Sclerotinia Libertiana* on chervil; *Oidium leucoconium* on green and dry peach branches and on almond fruits, and the perithecial form, *Sphaerotheca pannosa*, on rose and apple trees. Among new forms: *Sclerotinia Ocymi* on basil; the ascophorous form (*Cenangium populneum*) of *Dothichiza populea*; the probable reference of oak mildew with *Oidium ventricosum; Botryis parasitica* var. *Colchici*, *B. cinerea* f. *Dianthi.*

In 1910 the following observations were the most important: *Bremia Lactucae* Reg. on *Dimorphotheca; Sclerotinia Libertiana* Fuck. on *Scorzonera, Helianthus* (sunflower, Jerusalem artichoke), *Daucus Carota, Brassica* (cabbage and cauliflower), *Solanum*; the perithecial form of *Sphaerotheca pannosa* Lév. on peach twigs; *Rosellinia radiciperda* M. on apple trunks; *Gibberella moricola* (De Not.) Sacc. injurious to young mulberries; *Gloeosporium fructigenum* Berk. on pears; *Gl. lagenarium* (Pass) Sacc. on cucumbers; *Scolecotrichum melophthorum* Prill et Del., very injurious to pumpkins; and two new forms: *Botrytis parasitica* f. *Armeriae* and *Ramularia Doronici* Vogl.

Important observations made in 1911: *Lophodermium Pinastri* (Sch.) Chev. and *L. laricinum* Duby, on Scots pine and on larch; *Nectria ditissima* in a new form on apple trees; *Gibberella Saubinetii* (Mont.) Sacc. on wheat; *Coniothyrium Fuckelii* Sacc. on pear trees; *Ascochyta Cannabis* (Speg.) Vogl.= *Phyllosticta Cannabis* Speg., on hemp; *A. Begoniae* (Fl. Tassi) Vogl. = *Phoma Begoniae* Fl. Tas., on begonias; *A pirina* Peglion on pear trees; *A. piricola* Sacc. on white beam; *Colletotrichum Lindemuthianum* (Sacc. et Magn.) Br. et Cav. and *Scolecotrichum melophthorum* Prill. et Del. on young haricot plants; *Cladosporium Heliotropii* Eriks. on heliotrope *Macrosporium Solani* Ell. et Mart. on tomatoes; and three new species: *Sphaeronaema parasiticum* Vogl. on the leaves of *Crataegus glabra*, *Coniothyrium opuntiae* Vogl. on branches of the prickly pear, *Ascochyta laricina* Vogl. on the shoots of larch. In 1912 the following were observed: a bacteriosis of Oleanders; the disastrous parasitism of *Phytophthora Cactorum* on the stems of *Capsicum annuum; Pythium de Baryanum* parasitical on the roots of beans; *Sphaerella Vulnerariae* on the leaves of *Anthyllis Vulne-*

raria; Rhizoctoina violacea on chards or sea-kale beets and on parsley; the extensive and disastrous infections of *Ophiobolus graminis* Sacc. on wheat; *Cladosporium fulvum* var. *violaceum* on tomato leaves; *Ascochyta hortorum* injurious to the egg-plant and to capsicum, and some new species.

Among animal parasites the development of several species of *Hyponomeuta* and of *Carpocapsa* was followed and the means of control were taught.

In almost all the mountain valleys the leaves of larches were injured by *Coleophora laricella* and in the plains the plane trees by *Lithocolletis platani*.

In market gardens cabbage butterflies (*Pieris*) and cabbage moths (*Mamestra*) caused much mischief, *Polya dysodea* damaged lettuces and *Acrolepia assectella* leeks.

On fruit trees some very injurious Coleoptera were observed, such as *Otiorrhynchus*, *Anthonomus* and *Magdalis*; on the Canada and Carolina poplars, especially in young trees and in nurseries, the leaves in spring were often found rolled up or damaged by *Rhynchites* and by *Lina populi*. The leaves of elm trees are often infested by *Adimonia xanthomeleana*. On cereals *Zabrus gibbus* and *Agriotes lineatus* were studied; in many gardens *Lema lilii* devoured the leaves of the lily. As for Hymenoptera, the damage done to apple, plum, pear and currant by *Hoplocampa fulvicornis*, *Nematus ribis*, *Calyroa limacina* and *Lyda pyri* was observed. *Croesus septentrionalis* was found rather widespread on Canadian poplar. Several Diptera injured vegetables: *Phytomyza* on carrots and colza, *Aricia* on beets and on spinach, *Acidia heraclei* on celery. Among Hemiptera many species of *Aphis* and *Lachnus* have been observed and combatted on several vegetables, on roses, *Robinia* and *Sophora*. Very widely spread and injurious are *Hyalopterns pruni* on peach and *Schizoneura lanigera* on apple.

Chionaspis evonymi has now invaded almost all spindle trees; *Mytilaspis pomorum* tends to spread on the stems and branches of Canadian poplar notwithstanding the fact that some parasitic acari, *Emisarcoptes*, *Encyrtus*, *Eremeus minimis*, and several Hymenoptera, *Habrolepis zetterstedti*, *Aphelinus mytilaspidis* and *Physcus* sp. devour its eggs.

Diaspis pentagona was also found to be very widely spread, occurring on a great variety of trees and herbaceous plants.

Among acari, *Tetranychus* on vine, horse chestnut, haricots, etc., was found in many places causing drying up of the leaves. *Phytoptus* on fruit trees and *Pentaleus major* in market gardens, damaging beets, peas, pumpkins, etc., were also discovered.

The scientific observation of the life history of animal and vegetable parasites led to the publication of the "Enemies of the Canadian Poplar" and the yearly publication (begun in 1904) "The plant-parasites observed in the province of Turin and neighbourring districts", besides other notes and memoirs published by the staff of the Observatory.

The problems connected with the diseases of plants, and especially their control, are very complex.

It is not always possible to make use of the best remedies, owing sometimes to the difficulty of applying them, at others to their price being higher than that of the produce of certain crops. The Observatory is investigating some means of natural defence, such as growing resistant varieties, or the introduction of parasites which live at the expense of the injurious ones.

Some good result has already been obtained, as is proved by the confidence shown by the farmers in the Observatory ; which will continue on its course supported by the knowledge that it is contributing to the welfare of the agriculture of Italy.

Work of the Phytopathological Section of the Central Agricultural Experiment Station in Stockholm in 1912

by

Prof. JAKOB ERIKSSON,

Chief of the Section.

1. *Work on potato diseases.* — In contrast to 1911, when potato disease (*Phytophthora infestans*) hardly showed itself in Sweden, the season of 1912 seems to have been particularly favourable to the free development of this fungus. In this year the disease began to appear earlier than usual. The first reported case was on the 9th of July from a place in Östergötland. A week earlier, however, it had been noticed in a potato plot in a garden. In Scania, the disease was found near Malmö on the 17th of the same month. As the disease had occurred at such an unusually early date, the attention of growers was drawn to the subject by a communication to the papers, stating the advisability of immediate spraying with Bordeaux mixture wherever possible. A leaflet on the subject was also got out at once, entitled " Bespritning med Bordeauxlösning " (1) (Leaflet No. 35, July 1912). In this, instructions were given for preparing and applying the mixture. It was only during August that it seemed that the apprehensions of a year of serious disease had been exaggerated : in many places, such as about Stockholm, the potato haulm remained healthy well on into September. All the same, the apprehensions were in the end justified : when the crops were lifted, reports came in one after another from nearly all over the territory, including Scania, to the effect that the potato crops were much reduced by the disease.

Spraying had been carried out in various parts of the country : in all cases the results were remarkably good, although the sprayings were made very late (the first not till after the appearance of the disease).

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(1) " Spraying with Bordeaux mixture ". (*Ed.*).

In August a species of fungus, *Hypochnus Solani* Prill. et Del., hardly known before as harmful, appeared in several places, doing most damage at Tranås (Småland). The disease began on the lower parts of the stalks and appeared as a very dense whitish grey coating, reaching to 1 ½ or 2 inches above the ground, and stopping at the point of insertion of the lowest leaf. This whitish coating consisted of a mycelium of branched and septate hyphae. Below the soil this coating became darker, of a brownish colour, and extended onto the stolons and roots, where it became still darker and more compact, here and there producing sclerotia. These sclerotia, which were black, were found to belong to the species long known as *Rhizoctonia Solani* Kühn. During the year, an article on this disease was published under the title of "Filtsjuka å Potatis (*Hypochnus Solani* Prill. et Del.)" (1).

But the year 1912 will be recalled as a particularly serious one for the future of potato-growing in Sweden in that it saw the discovery in the country of the new and destructive disease known as "black scab" (*Chrysophlyctis endobiotica* or *Synchytrium Solani*), which has developed to an alarming extent in Great Britain during the last ten years. It is also firmly established in Germany, where it seems inclined to spread.

This disease was found on the 2nd of October, first in the garden of a house in the Stockholm archipelago (on the island Ljusterö) and soon after on a farm in Södermanland (near the railway station of Järna); it also occurred on some land belonging to the Agricultural Labourers' Benevolent Society, and lastly in a garden and neighbouring field about half a mile away from this land. From the investigation made, it appears that the centre of infection was the farm at Järna. The disease had established itself in 1910 or 1911, having been introduced in empty sacks sent by a salesman in Stockholm, who bought potatoes from this farm as well as from Germany, to sell in Stockholm. The disease was introduced into the garden in the Stockholm archipelago by seed potatoes which had come from the farm mentioned. The infected land amounted to about 14 acres, while the potatoes diseased comprised some 300 tons.

As soon as the disease was discovered, the authorities were informed; and a grant was asked for, first for the destruction of the diseased potatoes and for compensation to the growers under this head, and further for the disinfection of the soil in which the diseased crops had grown. For these two purposes the Swedish Government made an allocation of 4 000 crowns (about £220). The diseased crops were destroyed as follows: the potatoes were thrown into a large trench opened for the purpose and petroleum was thrown over them; the trench was then filled in. The diseased land was treated by watering with 1 per cent. formalin solution, at the rate of about 2 gallons per square yard.

To present the disease being introduced into other places, a proposal was brought forward to prohibit all importation of potatoes; but the Government has yet to come to a decision on this matter.

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(1) "Felt-disease" of potatoes. (*Ed.*).

2. *Work on beet diseases.* — Researches carried on for several years on beet diseases in Sweden led to the publication of an article on the subject in 1912. This is entitled "Svampsjukdomar å svenska betodlingar" (1); it deals with the following diseases: *Uromyces Betae* (Pers.) Kühn, *Bacillus tabificans* Del., *Rhizoctonia violacea* Tul., *Phoma Betae* Frank, *Cercospora beticola* Sacc., *Sporidesmium putrefaciens* Fuckel, and others.

A short study on *Rhizoctonia violacea* on beets, as well as on carrots, turnips and kohl-rabi, was published under the title "Etudes sur la maladie produite par le Rhizoctone violacé" (2) (*Revue générale de Botanique*, Vol. 25, p. 14). It has been found that the reddish fur which develops on the roots of these plants, at any rate that occurring on carrots, constitutes a sterile stage of a species of *Hypochnus*, which develops more fully on various other plants, *e. g.* chickweed (*Stellaria media*), *Erysimum cheiranthoides*, and sowthistle (*Sonchus arvensis*); all of these occur as arable weeds in the root-growing districts. The spore-bearing stage is named *Hypochnus violaceus* (Tul.) Eriks. This fungus therefore shows a sort of heteroecism.

3. *Work on the withering of flowers of fruit-trees.* — An account of the researches on this disease, also carried on for several years, was published in 1912 under the title "Om blom- och grentorka (Monilia-torka) å våra fruktträd" (3), as well as in German under the title "Zur Kenntnis der durch Monilia Pilze hervorgerufenen Blüthen und Zweigdürre unserer Obstbäume" (*Mycologische Centralblatt*, Vol. 2, p. 65). In this work, a point mentioned as of special importance for growers is to treat for the stage of development corresponding with the very first period of the fungus; in this stage it forms little grey pustules on the fruit-spurs and twigs, which may remain after the previous year's attack; the treatment should be carried out before the leaves open. These pustules contain the first generation of spores of the new year, and it is from them that the fruit and wood buds get infected soon after. It is of primary importance to get rid of these first centres of infection; this can be done by an early cutting-out of all dead wood, or by spraying the whole tree with 2 per cent. Bordeaux before flowering.

4. *Observations on diseases of vegetables.* — During 1912, a number of diseases occurred on horticultural plants of different sorts and were much discussed: many of them were new for Sweden. They were fungus diseases of cucumber, French beans, tomato, asparagus, rose, hyacinth, etc.

Among the researches into these diseases, only those on cucumbers and melons are so far ready for publication. A summary of these, under the title "Svampsjukdomar å svenska gurkväxtodlingar" (4) is in the press. The following fungi causing diseases are described: *Cladosporium cucumerinum* Ell. et Arth., *Cercospora Melonis* Cke., and *Colletotrichum lagenarium* (Pass.) Ell. et Halst.

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(1) Fungus diseases of Swedish beet crops. (*Ed.*).

(2) Studies on the disease produced by *Rhizoctonia violacea*. See No. 426, *B.* April 1913.

(3) On the withering of blooms and twigs (*Monilia*-withering) in our fruit trees. (*Ed.*).

(4) The fungus diseases of Swedish cucumber crops. (*Ed.*).

As the results of many of these investigations point to the seed as the source of the disease, a leaflet was published entitled "Tillvaratag frön från friska kulturer!" (1) (Leaflet No. 36, Aug. 1912).

5. *Examination of samples of diseased plants received at the Institute.*— In 1912, 515 samples were sent in; all were examined and reported on.

6. *Various work.*— Besides those mentioned above, the following publications appeared during 1912: "Fungoid Diseases of Agricultural Plants" (London: Baillière, Tindall and Cox, pp. XV + 208.)— "Ueber *Exosporium Ulmi* n. sp. als Erreger von Zweigbrand an jungen Ulmenpflanzen" (*Mycol. Centralblatt*, Vol. I, p. 35). — "Rostige Getreidekörner, und die Ueberwinterung der Pilzspezies" (*Centralbl. f. Bakt.*, Abt. 2, Vol. 32, p. 453). — "Krusbärsmjöldaggen i Sverige juni 1912" (2) (*Svenska Dagbladet*, July 8, 1912), and "Krusbärsmjöldaggen under juli månad" (3) (*Svenska Dagbladet*, Aug. 25, 1912).

At the International Congress of Comparative Pathology held in Paris from the 17th to the 23rd of October, 1912 a report was printed entitled "Que faire pour éviter les maladies propagées par les graines et les arbres des pépiniéristes?" (4).

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(1) Save seed from healthy crops. (*Ed.*).

(2) American gooseberry mildew in Sweden in June, 1912. (*Ed.*).

(3) American gooseberry mildew in July. (*Ed.*).

(4) What can be done to avoid the spreading of diseases by seed and trees from nurserymen? (*Ed.*).

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES.

766 - **Agriculture in Modern Greece.** — MARESCH, O. R., in *Österreichische Agrar-Zeitung*, Year 4, No. 15, pp. 174-178, Vienna, April 12, 1913.

The total area of Greece is 15 978 750 acres; this consists of:

Cultivated land	3 532 000	acres,	or 22.10	per cent.
Meadow and pasture	4 990 000	»	» 31.22	»
Forest	2 025 500	»	» 12.67	»
Waste land	5 431 250	»	» 34.01	»

The high percentage of waste land is explained by the circumstance that two-thirds of the area is either mountainous, and therefore only to a limited extent available for agriculture, or else too poor to be remunerative as arable land. Therefore other forms of cultivation are gradually gaining ground, such as olive groves, vineyards, vegetable gardens, etc., since the dry climate is suitable for deep-rooted plants (especially vines and tobacco), and because the extreme subdivision of the land, the deficiency in capital and credit, together with the low rate of wages, lead to the cultivation of those plants which, though they require more labour, yet fetch a higher market price.

The average size of the mountain holdings is from 1 ¼ to 2 ½ acres, while in the plain the farms run from 12 to 25 acres, and in Thessaly their extent is 250 acres or more. On the mountains wheat is usually taken after two or three years' fallow, while on the plains a simple three-crop rotation is practised.

Agricultural machines are of rare occurrence and it is only of late years that the old Hesiod plough has been replaced by better implements of Central European manufacture.

Manuring leaves much to be desired; artificial fertilizers are very seldom employed. The regulation of irrigation is also much neglected. Grain is threshed by animals treading it out.

Greece does not produce two-thirds of the 10 million bushels of wheat which it requires to supply its needs; though the million and a half bushels of barley grown supply the demand. The production of home-grown pulse is also inadequate. The annual maize crop is about 2 ¼ million bushels and the rice harvest is sufficient to supply the country. Potatoes are exported to a small extent. About 18 500 acres are under tobacco, producing annually about 190 000 lbs. of tobacco of excellent quality. Cotton-growing is increasing in importance.

In good seasons the vineyards produce an average of 88 million gallons of wine. The must is trodden out in a very primitive manner in rectangular walled-in pits. Next to cereals, dried currants are the most important product. About 116 000 acres are devoted to the vines producing them, and the value of the annual yield varies from £1 250 000 to £1 660 000. The net return from currant cultivation is often 8 per cent. of the capital expended.

Olives are grown throughout Greece, but little care is given to the trees. The cultivation of Southern fruit (oranges, lemons, figs, etc.) is much neglected. Lately, vegetable growing has made considerable progress and is a fairly good source of revenue, both to the islands and to the south-eastern portion of the mainland.

Cattle breeding does not form an independent branch of agriculture in Greece, for cattle are mostly kept for the purpose of turning the arable land to account. Horse breeding is at a very low ebb as there is a deficiency in capital and in good grazing ground. Amongst the native breeds of horses are to be distinguished the Skyros and Pindos; both are small, thrifty and surefooted. On account of the scanty supply of fodder, many more donkeys and mules than horses are bred.

Cattle are chiefly bred for draught, the production of milk and meat being quite a secondary consideration. Among the native breeds are: 1) the so-called Greek breed, distinguished by its light frame and the fine flavour of its meat: 2) the Macedonian, which, except for being somewhat smaller, possesses all the characteristics of the Steppe cattle; 3) the polled Syrian breed.

Greek sheep are noted for thrift and hardiness; in order that they may not lose these characters, they are not interbred with milk and mutton producing animals. The output of wool is negligible and the quality inferior. There are two indigenous breeds: the Greek or so-called peasant sheep, and the island breed. The former have thick long, pendant and usually dark-coloured wool, while the latter breed produces finer wool and is more exacting in its requirements.

Goat breeding is much developed; there are over 3 million head of these animals, or 80 per square mile.

Bee-keeping is a very ancient Grecian industry, and is especially common in the Cyclades. The annual production amounts to about 1000 tons of honey and 90 tons of wax.

767 - **The Extension of Plantations in the German Tropical Colonies.** — SCHULTE IM HOFE, A. in *Deutsche Kolonial. — Zeitung*, Year 30, No. 21, pp. 346-347. Berlin, May 23, 1913.

The writer estimates the capital at present invested in plantations in the German colonies at about £. 5 000 000. The areas brought under cultivation in the years 1907, 1908 and 1911 were, for the various crops, as follows:

Rubber plants.

	1907	1911
	acres	acres
East Africa	12 479	81 450
Kamerun	5 142	17 745
New Guinea	4 376	5 812
Samoa	1 510	2 130
Togo	237	405
	23 744	107 542

Coconuts.

	1908	1911
New Guinea	48 367	62 430
East Africa	15 538	16 818
Samoa	9 425	11 587
Togo	1 433	1 433
	74 763	92 268

Sisal Hemp.

	1907	1911
East Africa	25 588	52 721
Togo	74	324
New Guinea	86	220
	25 748	53 265

Cotton.

	1908	1911
East Africa	15 182	35 356

Cacao.

	1907	1911
Kamerun	18 961	26 327
Samoa	3 754	5 392
New Guinea	555	1 021
Togo	230	371
East Africa	247	247
	23 747	33 358

Coffee.		
East Africa	7 164	7 166

The following table shows the total area under cultivation, the number of white employees and the number of coloured hands in each colony.

1911	Acreage under cultivation	White employees	Coloured hands
East Africa	202 212	557	60 835
New Guinea	69 670	182	13 742
Kamerun	49 420	147	13 272
Samoa	20 641	78	2 053
Togo	2 647	8	536
Total in 1911	344 590	972	96 438
» » 1910	311 637	811	81 340
» » 1909	243 763	731	66 968
» » 1908	210 327	591	52 085

On account of the present shortage of labour in Kamerun and East Africa it need not yet be concluded that plantations have reached their limit of extension. The shortage of labour is rather due to the incomplete development of the railways, which causes about a half of the available labour to be engaged in carrying the produce to or from the interior and the coast or to the railway stations; this labour is thus withdrawn from productive work. Only through further extensions of the railways will the shortage of labour be avoided and new plantations rendered economically possible.

EDUCATION
ND EXPERI-
ENTATION IN
GRICULTURE
ND FORESTRY

768 – **The Promotion of Agricultural Instruction and Experiment in Switzerland by the Union, in 1912.** — *Bericht des eidgenössischen Handels-, Industrie- und Landwirtschafts- Departments über seine Geschäftsführung im Jahre* 1912: III. Abteilung, Landwirtschaft, pp. 2-10. Bern, 1913.

In 1912, 14 students of the agricultural division of the technical College at Zürich received a total grant of £170 13*s* from the Union. There are at present in Switzerland four Agricultural Schools which are open throughout the year (Strickhof-Zürich, 63 students in 1912; Rutti-Bern, 70 students; Ecône, Valais, 24 students; Cernier Neuenburg, 57 students), 15 winter-schools (992 students) and one Cantonal Horticultural School (at Geneva, 41 students).

The Union payed the Cantons half the educational expenses, which in 1912 amounted to £2286 3*s* for the whole-year schools, £5079 19*s* 3*d* for the winter schools, and £636 7*s* for the Geneva Horticultural School, or a total of £7992 9*s* 3*d*. The Intercantonal Fruit, Vine and Horticultural School at Wädenswil, which has 12 students, received a grant of £383 10*s* from the Union.

Further, the Union defrayed half the expenses (£1698 18*s* 6*d*) incurred by 15 Cantons for agricultural lectures and courses, and for experiments on cheese-making, stall-feeding and manuring of pastures. Six Cantons had half their expenses for vineyard experiments paid, the sum granted amounting to £957 16*s* 8*d*.

The Union supports three Agricultural Chemistry Institutions (Zürich, Bern, Lausanne), two Seed Control Stations (Zürich and Lausanne), and one Dairy and Bacteriological Experiment Station at Liebefeld in Bern. Last year these institutions carried out 2057 field experiments, 53 vineyard experiments and 522 pot experiments, as well as 28350 other investigations (concentrated feeds, fertilizers, soils, milk, seeds, etc.) in the laboratory. The Dairy Institute at Liebefeld has provided cheese factories with 4959 pure cultures for the preparation of rennet. The total number of experiment stations cost the Union £16934 8*s*, which must be set against receipts amounting to £4393 16*s*.

The Swiss Experiment Station for Fruit, Vines and Horticulture at Wädenswil, with an income of £831 9*s* and expenses amounting to £4449 2*s*, required a contribution of £3617 13*s* from the Bank of the Union. The Station, in addition to experimental work, holds short courses on fruit and vine growing, which were attended by 503 students.

Three Cantons (Bern, Freiburg and Vaud) have dairy schools, with a total of 121 students. The Union defrayed half the cost of these, which was £1349 17*s*.

769 – **The Study of the Science of Rural Administration at the Berlin Agricultural College.** — Fink, E. Von den landwirtschaftlichen Abteilungen der Hochschulen. — *Landwirtschaftliche Umschau*, Year 5, No. 15, pp. 355-356. Magdeburg, April 11, 1913.

The Berlin Agricultural College (Landwirtschaftliche Hochschule) has organized for the present summer term, a special course of instruction in the Science of Administration in order to supply the necessary information on this subject to persons intending to qualify for entrance into the service of the Chambers of Agriculture, or similar bodies, or of large agricultural corporations, associations, etc., or to become agents and managers of large estates or agricultural-technical undertakings.

The course lasts two sessions and a special examination can be taken at its conclusion, which is optional and is regarded as supplementary to the examination for the agricultural diploma, or certificate of instructor in agriculture. The curriculum includes lectures on the following subjects, which are supplemented by practical work in the College.

1. The principles of national and communal administration.
2. Rural administration.
3. Civil law.
4. Finances.
5. Insurance : social and private insurance.
6. Selected chapters of agricultural policy.
7. Cooperation in its relation to agriculture; organisation and present conditions of agricultural cooperation in Germany.
8. The use of cooperation in agriculture; its principles, history and different forms.
9. The technique of cooperative administration, including the administration of cooperative unions.

10. The law of cooperation.

11. The principles of commerce: the general principles of commerce and their application to rural economy. The principles governing wages, credit and Stock Exchange operations.

770 – **The Teaching Method in the Provincial School of Agriculture and Cattle Breeding at Ath, Belgium.** — Lonay, Alex. in *Annales de Gembloux*, Year 23, Part 4, pp. 198-199. Brussels, April 1, 1913.

The method of instruction adopted in the Ath Provincial School of Agriculture and Cattle Breeding is the so-called direct or "active" method, by which the student learns chiefly by his own exertions: he is required to test all he hears from his teacher by reference to nature, if possible, or else by having recourse to photographs and drawings, etc; he must accustom himself by practice to measuring, valuing and calculating, as well as to estimating the age, value and defects of animals, the condition of land and of crops, and the comprehension of leases, contracts for buying and selling, as well as the formulae used in analyses.

In order to make it possible to practise this method of instruction, the plan of study is not divided, as is customary, into hours, but into half days. The lecturers on farm crops and animal husbandry are required to demonstrate from the crops and animals on the land and at the homestead, instead of following the usual text-book methods.

The lectures on the principal branches of agriculture (tillage, crop cultivation and the science of breeding) also give instruction in the preliminary scientific subjects (physics, organic and inorganic chemistry, mineralogy, geology, botany, zoology and bacteriology). In this manner, the students, while not going into unnecessary details, acquire a sufficient knowledge of pure science to enable them to understand thoroughly the chief branches of their work. Every instructor is also required to explain the working of the machines and the use of the implements employed in the branch of agriculture treated by him. Finally, they must treat different branches from the economic standpoint, as well as from the technical side, so that the students can from the beginning have a right idea of rural economics.

In order that this method may be satisfactorily carried out, the instructor must have been trained for the purpose and be provided with suitable and abundant material. Each Chair is provided with an assistant (assistant lecturer), whose duty it is to prepare the material required.

771 – **Rural Continuation Schools.** — Kolatschek, A. W. in *Österreichische Agrar-Zeitung*, Year 4, No. 13, pp. 145-148. Vienna, March 29, 1913.

Rural continuation schools have been established for the purpose of giving to the greater majority of peasants' sons, who are unable to attend an agricultural school, the opportunity of retaining and extending, by means of at least a few hours' instruction in the week, such information as they have acquired in the elementary school.

In Württemberg such continuation schools were started as long ago as 1857, under the name of "Winter-evening Schools". In 1859 there were already 180 rural continuation schools, founded by the communes with the assistance of the agricultural societies. In an appendix to the laws relating to the elementary schools, dated November 6, 1858, the attendance at one of the winter-evening schools established voluntarily by the communes was made obligatory for every boy on leaving the elementary school. A Ministerial Decree of February 1, 1866, assured to the communes a State grant to meet half the expenses incurred in founding such schools, and further required the attendance at these schools of all youths between 14 and 18 years of age who had completed the ordinary course of instruction. The Central Office for Agriculture superintends the agricultural portion of the curriculum. In 1867 there were 600 winter-evening schools in Württemberg.

In Rhenish Prussia, agricultural continuation instruction was first given in 1859. There, its introduction and promotion were due to the exertions of the Central Agricultural Union for Rhenish Prussia, which brought before the Government the importance of such instruction and the necessary measures for imparting it. On April 30, 1867, a Government decree was issued with the view of preparing teachers for this work; it required that more attention should be devoted to natural science in the Teachers' College of the Province of Rhenish Prussia and that agriculture should be included in the curriculum.

In the Grand Duchy of Hesse, there were at this date already four farm-schools and agricultural winter schools, while from 1831 to 1839 a winter school had existed in Darmstadt. Much is hoped in the future, when there is a sufficient teaching staff, from the effect upon the farmers of peripatetic agricultural instructors.

In Bavaria, a Ministerial Decree of January 25, 1867, introduced Agricultural Continuation Schools; the establishment and superintendence of the winter-evening schools was entrusted to the Agricultural District Committees ("Kreisausschusse").

In Baden, Freiherr von Babo had succeeded by 1880 in getting agricultural instruction included in the curriculun of 30 village schools. In 1867 there were, however, already 10 agricultural winter schools. Afterwards, in Baden also, peripatetic instruction was considered of chief importance.

In Austria, in the years 1848, 1869 and 1872 several general Ministerial Decrees also dealt with the promotion of agricultural continuation instruction, in that they allowed, or advised, the teachers to impart it. It was, however, not until September 3, 1875, that a decree was issued containing measures for the establishment and maintenance of agricultural continuation schools. The Imperial Education Law ("Reichsvolksschulgesetz") of May 2, 1882, left it to the district councils ("Landgesetzgebung") to make the necessary arrangements regarding these schools and courses of instruction. The Ministerial Decree of September 2, 1872, had, it is true, made agriculture a compulsory subject in the Teachers' Colleges, but this provision remains in abeyance even at the present time, for the demands made on the time of the students at these Colloges are so manifold that these is no time to spare for instruction in agriculture. In order to remedy this unsatisfactory state of affairs, the writer suggests that during the summer a five-months' course should be held in the agricultural winter schools in order to qualify young elementary-school teachers to conduct country continuation schools.

772 – **Teaching Manual Work in the Country.** — PABST in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Part 18, pp. 263-266. Berlin, May 3, 1913.

The writer draws attention to the necessity and the opportunity for introducing into the curriculum of rural elementary and continuation schools a course of manual work adapted to the requirements of the different districts. He gives the general outlines of a scheme whereby the present training of teachers could be modified with a view to their being competent to impart such instruction.

773 – **Technical Instruction in Ploughing.** — MURRAY, A. in *The Journal of the Board of Agriculture*, Vol 20, No. 2., pp. 116-120. London, May 1913.

The writer lays special stress on the importance of practical technica- instruction in ploughing, and gives a short description of a course of instrucl tion on this subject (usually lasting 2 days) which was organized some years ago by the Hants County Council, with the assistance of the Hants Agricultural Association. Persons taking the course were instructed in the construction of the various types of ploughs, in their use on different soils and for different purposes, as well as in the actual operation of ploughing. At the conclusion, there was a ploughing demonstration and prizes were distributed.

774 – **Second Practical Course of Wine Analysis by the Physico-Chemical Volumetric Method** (1).

The second practical course of wine analysis by the physico-chemical volumetric method will be given by Messrs. Paul Dutoit and Marcel Duboux, Professors of Physical Chemistry at the University of Lausanne, its object is to acquaint analytical chemists in as short a time as possible with the new methods of analysis by means of electric conductivity which are described in the *Traité d'Analyse des Vins par Volumétrie physico-chimique* (Lausanne, Rouge) (2).

It consists of: 1. Some theoretical lessons relating to the general principles of the method and their application. 2. A considerable amount of practical work, consisting chiefly of analyses, for all those who attend the course. (Each person will be provided for this purpose with the necessary materials for experiment and with an apparatus for determining electric conductivity).

The practical work is so arranged that the determinations which are always required (ash, sulphates, chlorides, tartaric acid, acidity) are made first. The estimation of other constituents of wine (phosphates, potash, lime, magnesia, malic acid, succinic acid, etc.), which the chemist rarely carries out owing to the lack of rapid and accurate methods, are demonstrated later. Finally, a few examples in the determination of the total alkalinity and of acidity of wines will show the chemists that the conductivity method enables certain important elements to be estimated which are not detected in ordinary analysis.

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(1) For the programme of the first course, held in 1912, see No. 1133, *B*. Aug. 1912.

(2) See also P. DUTOIT and M. DUBOUX. The Analysis of Wines by a Physico-Chemical Volumetric Method. pp. 2562-2569, *B*. December 1912. (*Ed*).

The course and practical work will take place in the Laboratory for Physical Chemistry at the University of Lausanne from July 21 to 29, 1913. Persons intending to attend the course can send in their names up to July 10. Address Prof. Paul Dutoit (Solitude 19, Lausanne). The entrance fee is 50 francs and includes admission to the course and to the practical work, as well as the use of the apparatus and necessary materials tor analysis.

AGRICULTURAL SHOWS AND CONGRESSES

775 – **Agricultural Shows.**

Argentina.

1913. October 12-14. Olavarria (Buenos Aires). Cattle Show organized by the Sociedad Rural Argentina.

Australia: New South Wales.

1914. February 17-19. Show of the Guyra Pastoral, Agricultural and Horticultural Society. P. N. Stevenson, Secretary.

February 25-27. Show of the Inverell Pastoral and Agricultural Association. J. Mc Ilveen, Secretary.

March 10-12. Show of the Central New England Pastoral and Agricultural Association (Gleen Innes). George A. Priest, Secretary.

March 17-20. Show of the Armidale and New England Horticultural Association, A. Mc Arthur, Secretary.

April 29-May 1. Show of the Northern Agricultural Association (Singleton). E. J. Dann, Secretary.

Belgium.

1913. Ghent. National Show of the Adulteration of Food at the Universal and International Exhibition at Ghent.

August-September. Malines. Show of Intensive Agriculture organised by the town with the cooperation of the agricultural "comices" of the arrondissements.

Nov. 8-10. Brussels. Show of the Brabançonne Club. For information apply to M. Picard at Nivelles, or to M. W. Collier, 97 Rue des Cailloux, Jette-Saint-Pierre.

November 8-10. Borgerhout, 13 Rue Saint-Joseph. National Poultry Show organized by the Neerhof Society of Borgerhout. Secretary, M. Ing. Dierckx, 221 Chaussée de Turnhout, Borgehout, Antwerp.

November 15-17. Charleroi. Show organized by the Rabbit Club of the Bassin de Charleroi. Secretary, M. A. Hoe, Place du Sud, Charleroi.

December 20-22. Antwerp. Eleventh International Poultry Show. For information apply, 28 Rue Corfs, Antwerp.

Brazil.

1913. September. Rio de Janeiro. National Rubber Exhibition.

France.

1913. August 2-4. Amboise (Indre-et-Loire). Horticultural Show.

August 14-17. Maisons-Laffitte (Seine et Oise). General Horticultural Show organized by the Horticultural Society of the town. Apply to the Vice-president of the Society, M. Jacquot, 33 Avenue Longueil, Maisons-Laffitte.

August 20-24. Clermont-Ferrand (Puy-de-Dôme). Show of Agricultural Machines and Implements organized by the Agricultural Comice of the arrondissement, on the occasion of the Congress of the Federation of Mutual Assistance and Agricultural Cooperation.

August 20-25. Clermont-Ferrand (Puy-de- Dôme). Horticultural Show.

September 6-7. Privas. (Ardèche) Farm competition (prizes for crops) and Public Exhibition organized by the Ardèche Society for the Encouragement of Agriculture. Apply to M. F. Besson, Secretary of the Society, Privas.

September 6-8. Tarare (Rhone). General Horticultural Exhibition organised by the Horticultural and Viticultural Society of Tarare. Apply to the President of the Society, 70 Rue Savoie, Tarare.

September 13. Pithiviers (Loiret). Show of beet-lifting machines organised by the Agricultural Society of the Pithiviers arrondissement. Apply to M. L. Lesage, Fresne, par Marsainvilliers (Loiret), Secretary of the Society.

September 13-15. Salies de Béarn (Basses Pyrénées). General Exhibition of all the Products of Horticulture, Viticulture and of the industries connected therewith, organized by the "Syndicat d'initiative" of Salies-de-Béarn, with the co-operation of the Horticultural and Viticultural Society of the Basses-Pyrénées.

September 13-21. Arras (Pas de Calais). Second Motocultural Show and Show of Agricultural Motors and "Monobatteuses" organised by the French Motocultural Society. Apply to the General Secretariat of this Society, 58 Boulevard Voltaire, Paris.

September 27. Boistrancourt sugar-factory on M. de Guillebon's property. Exhibition of beet-lifting machines, organized by the Agricultural Comice of Iwuy (Nord).

September 28-29. Montmorency (Seine-et-Oise). Horticultural, Viticultural and Fruit Show organized by the Circle of Practical Arboriculture of Seine-et-Oise. Apply to the Secretary-General, M. A. Vigneau, 22 Rue de Pontoise, Montmorency.

October 9-12. Montpellier. Great Exhibition of the Products of Horticulture and of the Arts and Industries connected therewith, organized by the Federation of the "Sociétés Horticoles du littoral" with the cooperation of the Herault Society of Horticulture and Natural Science. Apply, the Secretary-General, M. Vachet, 6 Boulevard de l'Observatoire, Montpellier.

November 6-9. Brest (Finistère). Horticultural Exhibition.

1916. Marseilles. Colonial Exhibition.

Germany.

1914. April 3-5. Cologne. Municipal Market and Abattoir. A Show of Animals for the Butcher and of Fat Animals, annexed to the Exhibition of Agricultural Machines, Implements and Agricultural Products, of Stock-Breeding and the Meat Industry and to a Show of Fat Poultry (killed). Apply to the "Direktion des Schlacht und Viehhofes".

Hungary.

1913. September 5-8. Kolozsvár. Seventeenth Show and Market of Stud Animals and Nineteenth Exhibition and Market of Agricultural Machines and Products organized by the Association of the Agriculturists of Transylvania with the support of the Minister of Agriculture for Hungary.

October 9-20. Budapest. Horticultural and Viticultural Show. Apply to the National Horticultural Society of Hungary, (Budapest IV, Molnár, No. 25.

Italy.

1913. September 20-21. Cremona. Show of Heavy Belgian Horses and Light Draught Horses of Hackney origin. Last date of entries, August 20. Apply, 8 Via Lungacqua, Cremona.

September 23-24. Cremona. Show of Milch Cows of the Brown Breed confined to Breeders of the Province of Cremona. Lungacqua 8, Cremona.

United Kingdom.

1913. November 1-7. London, Royal Horticultural Hall. Thirty-fifth Annual Exhibition and Market of the Brewing Industry. Apply to the Managing Director of the Exhibition, 46 Cannon Street, London, E. C.

1914. May-October. Bristol. International Exhibition. Apply to the Bristol International Exhibition Limited, Central Chambers, St Augustine's Parade, Bristol, or to J. Bellham, Esq., 274-277 Bank Chambers, High Holborn, London, W. C.

1914. May-October. Manchester. International Exhibition. The Cotton Industry and the Products of the British Colonies will be largely represented : a special section will be devoted to machines.

United States.

1915. Day of Opening February 20. San Francisco. Show of New Varieties of Roses. $ 1 000 given in prizes.

776 – **Congresses.**

Belgium.

1913. August 18-20. Ostend. Sixth International Fisheries Congress. Address to " Secrétariat général du VI^e^ Congrès International de la Pêche ", Kursaal, Ostend, Belgium.

France.

1913. August 22-31. Soissons (Aisne). Second International Congress of Motor Culture, of Agricultural Motors and of Improved Cultural Methods, organized by the French Society of Motor-Culture.

This Congress, which will include an agricultural section and a machine section, will be combined with an international motor-culture competition and an exhibition of motors, machines and implements. For all information, apply to the Secretary General of the Society, 58 Boulevard Voltaire, Paris.

October 1-3. Lyons. First French National Cold-Storage Congress. A cold-storage exhibition will be held in connection with the Congress.

Germany.

1913. August 25-28. Trier. General Assembly of the German Forestry Association (" Deutscher Forstverein ").

Italy.

1913. September 21, Cremona. Zootechnical Congress, Apply, Via Lungacqua 8, Cremona.

Switzerland.

1914. Berne. Fourth Congress of the International Professional Horticultural Union.

CROPS AND CULTIVATION.

777 – **Studies on Lateritization.** — 1. BERNARDINI, L. and MAZZONE, G. La laterizzazione nei terreni dell'Italia Meridionale. — *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 2, pp. 146-156. Modena, 1913. — 2. GORTANI, M. Terra rossa, bauxite, laterite. — *Giornale di Geologia Pratica*, Year XI, Part I, pp. 21-39. Parma and Turin, 1913.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1. Following on the lines laid down by Ulpiani (1), the writers have applied van Bemmelen's methods of research to samples of soil from some provinces of Southern Italy. It appears that they have found that in that part of the country lateritic soils are widely spread and that the weathering of aluminous rocks leads to the prevailing formation of laterite instead of clay. Nevertheless they point out, with Ulpiani, that no certain conclusion can yet be drawn as to the intensity and diffusion of the process of the formation of laterite in the soil of Southern Italy, on account of the fact that the methods proposed by van Bemmelen for the diagnosis of lateritic soil have still to be perfected, and also because the number of soils hitherto examined is too small to allow of precise conclusions being reached. At the Royal

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(1) See No. 1609, *B*. Dec. 1912. (*Ed.*)

Chemical Agricultural Station of Portici investigations in both directions are being carried out.

2. The writer observes that recently considerable progress has been made in the knowledge of the petrography, chemistry and history of three types of aluminous and ferruginous rocks : red earth, bauxite and laterite. Considering the importance of these rocks, especially from the agro-geological point of view, and the confusion of words and ideas concerning them, he examines critically the results hitherto obtained and arrives at the following conclusions :

I. Under the name "red earth", the insoluble residue of limestones and dolomites is designated. It is essentially constituted by aluminium hydroxide, almost always with iron hydroxides and other minerals, sometimes authigene, at other times to a greater or less extent allothigene.

II. From the geological, lithological and practical points of view it appears advisable to reserve the name of "bauxite" for those rocks consisting essentially of hydroxides of alumina (and iron) which are included in calcareous formations and which therefore reveal themselves as ancient "red earths".

III. The name "laterite" is to be extended to all rocks essentially formed by hydroxides of alumina (and of iron, titanium and manganese) derived from the alteration of silicate rocks.

In the formation of laterite, doubtless many causes have concurred ; some of them taken singly explain the origin of individual deposits, but the causes and general laws which govern this formation are still unsolved prolems. In view of this uncertainty, the opportunity of distinguishing the various kinds of laterite as to their age, composition, etc., seems to the writer to be very doubtful, and equally doubtful appear to him the general deductions that some writers infer from local observations or from too special and incomplete researches. In this particular case he doubts the correctness of the above-mentioned conclusions formulated by Ulpiani and his school, because the samples of soil dealt with, coming as they do from calcareous districts, do not appear to be "laterites" but "red earths". This error probably arises from the purely chemical method that has been followed, namely that of taking as a basis the molecular ratio of silica and alumina soluble in hydrochloric acid.

IV. The process of "ferrettizzazione" (1) is also probably connected with the preceding forms of alteration. The writer considers that a modern and accurate investigation of this phenomenon would be very desiderable, both as regards its precise nature and the probable profound difference between the "ferretti" derived respectively from silicious and calcareous rocks.

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(1) Formation of "ferretti", ferruginous clays of the sub-alpine alluvial plateaus. (*Ed.*).

778 – On the Alkaline Reaction which may be caused by Acids and Acid Salts in the Soil. — MASONI, G. (Laboratory of Agricultural Chemistry of the Royal University of Pisa) in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Part 4, pp. 241-263. Modena, 1913.

It is well known that the reaction of the soil exerts a great influence on its fertiliy (1). The writer has conducted some experiments either by treating soils containing more or less lime with $\frac{N}{50}$ or $\frac{N}{100}$ solutions of acids and acid salts in flasks, and then examining the liquids, or by examining the liquids obtained by percolation from the soils treated in funnels or in tubes open at both ends; and he has observed that mineral and organic acids and their acid salts can cause an alkaline reaction in soils.

The explanation of the fact appears to be in the formation of calcium bicarbonate, not excluding however the possibility of other more general causes, such as the action of the acids on basic salts, which may always be present in soils (lime, magnesia, alumina, etc.). Phosphoric acid and the bi-acid calcium and potassium phosphates have shown a special behaviour. The persistence of the acid reaction with phosphoric acid seems to be explained by the formation of mono-calcium phosphate, which, on account of its very weak acid affinity, may remain unchanged, notwithstanding the excess of lime. The alkaline reaction, which nevertheless may be obtained with pure calcium carbonate or with soil well pressed into long tubes, appears to depend on the special conditions which facilitate the action of carbon dioxide, and consequently the formation of bicarbonate. From the above it follows that it is still more difficult to obtain the alkaline reaction with mono-calcium phosphate. The alkaline reaction which may be had with mono-potassium phosphate is explained by the formation of alkaline carbonate at the expense of the lime.

In connection with these investigations, it is mentioned, from a practical point of view, that the use of mineral acids (sulphuric acid for instance) against weeds may produce an alkaline reaction in calcareous soils. Ferrous sulphate, which also possesses an acid reaction, on the contrary does not cause an alkaline reaction on account of the formation of insoluble compounds. As may be expected for the reasons given above, the use of superphosphates leads to the continuance of the acid reaction.

Of especial interest, lastly, is the question of root secretions. The carbonic acid produced by the respiration of roots must produce in calcareous soils a medium having an alkaline reaction; besides which the acids, which according to various writers are admitted to be secreted by roots, should also contribute to the production of an alkaline reaction in calcareous soils. Experiments made in this connection appear in fact to have demonstrated the production of a distinct alkaline reaction caused by roots in soils containing lime. These experiments will be resumed, especially in connection with the study of the causes of chlorosis.

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(1) See No. 42, *B*. Jan., 1912. *(Ed.)*.

779 – **Some Bacteriological Studies of Old Soils.** — SHARP, L. T. (University of Nevada) in *The Plant World*, Vol. 16, No. 4, pp. 101-115. Baltimore, Md., April 1913.

The writer had the opportunity of studying soil samples from the collection of Dr. E. W. Hilgard which had been tightly stoppered for from 25 to 33 years; he was thus enabled to investigate the bacterial flora still present in them and the resistance of organisms to drying of the soil, which is a problem of much practical and scientific interest. Of the 9 samples examined, two were taken from alkali soil, two from adobe ridge (surface soil and subsoil respectively), one from adobe 10 to 20 inches in depth, one from black adobe 6 to 12 inches in depth, one from loam, one from foothill sandy soil 1 to 12 inches in depth, and one from rich loam.

The summary of the investigations was as follows:

1. Soils free from excessive alkali salts retained from 75 000 to 570 000 organisms per gram after thirty years drying under room conditions. Alkali soils contained under similar conditions 5000 to 60 000 organisms per gram.

2. The ammonification flora is most resistant, being especially strong in the alkali soils.

3. Nitrification occurs feebly in two soils and is permanently destroyed in the other seven soils.

4. Though *Azotobacter* forms are entirely absent in all but the foothill sandy soil, the nitrogen fixation power of the soils is well maintained by other organisms.

5. There is no relation between numbers and physiological efficiency.

6. The persistency of these organisms under dry conditions and their renewed activity in the presence of sufficient moisture is agriculturally important.

7. The soil exhibits a protective function towards lower forms under adverse conditions.

780 – **The Value of Soil Analyses to the Farmer.** — HALL, A. D. (The Development Commission). — *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 1-9. London, 1912.

After having dealt with the subject at length, the writer thus summarises the present position of soil analysis:

1. Mechanical analysis enables us to classifiy soils and assign an unknown example to its type.

2. From the type, combined with knowledge of the situation and climate, we may predict its suitability or otherwise for particular crops.

3. Chemical analysis will tell us whether a soil is getting acid or needs liming to make it work properly and utilize the manure supplied to it.

4. From chemical analysis we can settle what class of manures ought to be used — whether sulphate of ammonia or nitrate of soda, superphosphate or basic slag.

5. Chemical analysis will often reveal particular deficiencies and the specific need for phosphates or potash, but to do this with any certainty, the composition and behaviour of soils of that type should be known from a previous soil survey.

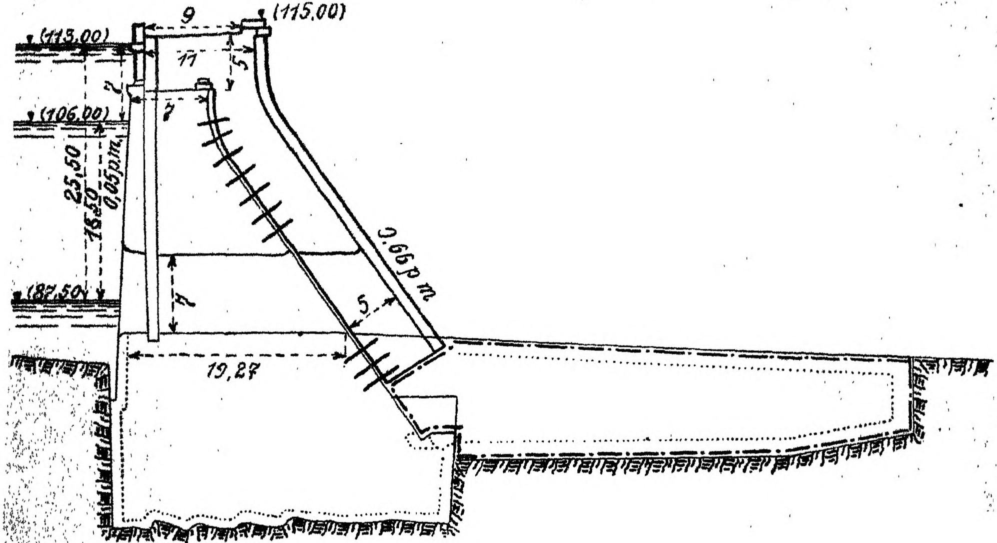
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Fig. 1

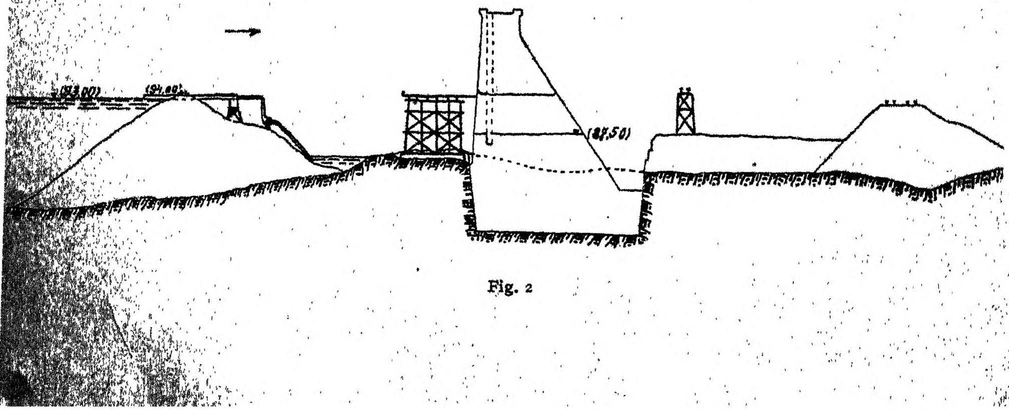
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Fig. 2

The writer draws attention to the fact that abnormal soils have frequently to be dealt with, and in order to attack the problems presented by such soils it is necessary in the first place to accumulate information and data as to the nature and composition of known soils, and in the second place to increase our knowledge and perfect our methods of analysis.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

781 - **Irrigation in Egypt and the Nile Dams.** — LUIGGI, L. in *Annali della Società degli Ingegneri e degli Architetti Italiani*, Year 18, No. 10, pp. 263-279. Rome, May 12, 1913.

In ancient times Egypt was the best irrigated country in the world. The waters of the Nile were used for fertilizing and irrigating the country. But through imperfect upkeep the works were allowed to fall into decay and lost their importance. Only during the last decades new works have been undertaken which restore to the Nile its former importance. New dams have been built and the network of canals has been extended. The most important barrage is that of Assouan. Fig. 1 shows its cross-section and gives its chief dimensions in metres (1 metre = 39.37 inches). Fig. 2. shows the cross section of some of those preliminary works that had to be made to drain certain localities.

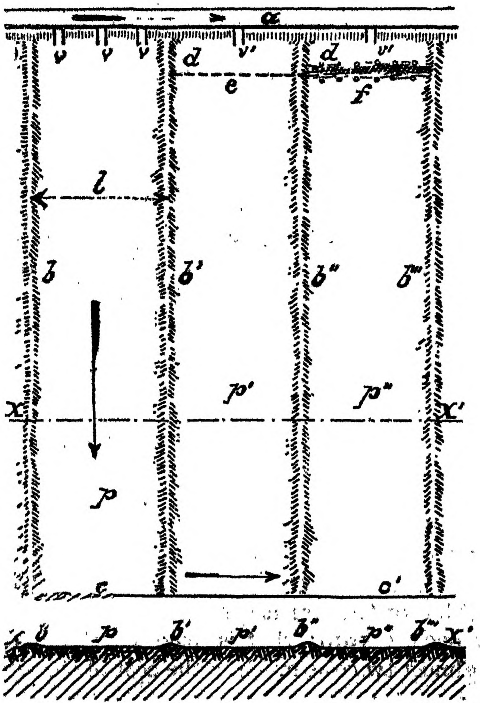
The total cost of this work amounted to about £ 10 500 000, but the advantages produced by it exceeded all expectations. The yearly rent of the land, which averaged before 1894 about £ 3 12*s* 6*d* per acre, rose to £ 9 13*s* 6*d*, and principally because, whilst formerly only one crop a year was possible, now two and sometimes three are attainable and cotton growing has become common. Lucerne gives as many as twelve cuts per year.

The rental value of the soil has risen from £ 15 500 000 per year in 1895 to £ 34 500 000 in 1910; that is, the yearly increase amounts to £ 19 000 000, or almost twice as much as the cost of the whole work.

782 - **Irrigation on Narrow Strips.** — RINGELMANN, M. in *Journal d'Agriculture pratique*, Year 77, Vol. 1, No. 19, pp. 599-601. Paris, May 8, 1913.

When irrigation by flooding has to be carried out on fields having a very slight fall (½ or 1 per 1000) and a considerable length, it becomes necessary to diminish the breadth of the field in order to prevent the formation, in some points, of currents which would erode the soil.

This erosion of the soil can never be completely avoided, especially where considerable quantities of water are used, but it can be much reduced when the breadth of the strip to be watered is diminished, and this can be done, as is shown in the accompanying figure, by dividing the field into long narrow strips (p, p', p") limited on each side by small embankments (b, b', b"). The breadth of these strips is from 16 to 33 feet. Their length varies between 100 and 200 feet, in some instances 500 and even 2600 feet, but this method is not advisable, for, as is well known, with the increasing length of the strip the oxygen content of the water diminishes. The height of the little embankments between the strips varies from 2 to 4 inches and their breadth between 12 and 24 inches. In the annexed figure the irrigating channel is shown in (a) and the outflow drain in (c, c'). In order to prevent erosion taking place at the upper end of the field either several openings (v) are made at distances of 10 feet from each other in the irrigating channel, or only one opening (v')



leading into a small reservoir (*d*) whence it flows through a barrage (e f) onto the field.

In the second part of the paper the writer describes a case in which this system has given excellent results.

MANURES AND MANURING

783 – **Thirteen Years of Experiments with Farmyard Manure at the Askov Experiment Farm, 1898-1910.** — *49th Circular of the State Service for Agricultural Experimentation*, Copenhagen, March 28, 1913. Communicated by the Danish Office of the International Institute of Agriculture.

Experiments conducted with the following soils and rotations :

Light loamy soil . . . . . {
Rye.
Hoed crops.
Oats.
Seeds.
Seeds, or mixture of 3/5 barley and oats, 2/5 peas and vetches.

High, dry sandy soil . . .	Rye. Hoed crops. Oats. Seeds, or above mixture.

During the last four years the seed-ley was no longer kept down a second year, so that the rotation was the same for both soils.

Different amounts of dung given at the same time. — The yearly quantities applied were respectively, 5000, 10 000 and 15 000 Danish pounds per tondeland (1), divided as follows: on the loam soil, during the first years $^2/_5$ to the rye, $^2/_5$ to the hoed crops and $^1/_5$ to the oats; during the last years $^3/_4$ were given to the hoed crops. On the sandy soil one half was given to the hoed crops and the other half to the oats; besides which control plots were made, no manure being given to them.

Average results in fodder units per tondeland.

	Loam soil lbs.	Sandy soil lbs.
Unmanured plots	2663	1414
Plots with 5000 lbs dung per year . .	3181	—
Plots with 10 000 lbs. » » » .	3518	2583
Plots with 15 000 lbs » » » .	3807	2998

Referring the excess of crop to the quantity of dung used, the following comparative data are obtained.

Excess of crop in fodder units referred to every 1000 *lbs. of dung per tondeland.*

	Loam soil lbs	Sandy soil lbs
Plots with 5000 lbs. per acre .	104 (156)	—
» » 10.000 » » » .	86 (117)	117
» » 15 000 » » » .	76 (98)	106

The data in brackets represent the results of a series of experiments in which the crop on the control plots was smaller.

The principal result of these experiments is that the useful effect of stable manure diminishes considerably with the increase of the quantities employed. In loam soil this decrease was from 12 to 16 per cent. of the excess of crop in passing from a medium to a heavy application of dung; in sandy soil the decrease was 10 per cent.

Different times of application of dung, with or without liquid manure. — Using three different amounts of dung on the loam soil and only one on the sandy soil, the dung was applied to some plots of hoed crops and oats in the spring (April or early May) and to the other plots in the preceding autumn (November). For rye the manure was given immediately before sowing, usually at the beginning of September. The stable manure contained about the same amount of plant food in autumn as it did in spring.

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(1) The Danish pound = 1.1023 lb.; the tondeland = 1.36 acre. (*Ed.*).

The liquid manure was given in spring to half of the plots on loam soil. In the first years it was given both to the hoed crops and to the seed-ley; to the former in doses of 20 000 lbs. per tondeland and to the latter of 10 000 lbs. In recent years the amounts were proportional to the amount of dung applied and they were given only to the hoed crops.

Average crops in fodder units per tondeland.

	Loam soil	Sandy soil
Plots manured in autumn without liquid manure	3 453	2 281
Do. in spring without liquid manure	3 551	2 589
Do. in autumn with liquid manure	3 767	—
Do. in spring with liquid manure	3 809	—

On loam soil the use of manure in autumn as compared with its use in spring yielded 3 per cent. less of the total crop when liquid manure was not given in the following spring, but when this was given to hoed crops and to seed-leys forage plants the loss was reduced to 1 per cent. Thus the liquid manure not only contributed to increase the crops, but also to diminish the loss due to the application in autumn; in fact these losses, with hoed crops, were 4 and 8 per cent. accordingly as the liquid manure had been applied or not and with oats 2 and 5 respectively. In sandy soil the average loss due to the application of manure in autumn was 12 per cent. of the total crop, distributed among the various crops as follows: 3 per cent. for rye, 16 per cent. for beets, 7 per cent. for potatoes, 19 per cent. for oats and 6 per cent. for seeds.

The liquid manure applied to clayey soil manured in autumn produced an increase in the crop of 15 fodder units per lb. of nitrogen, but only of 13 when given with spring manuring. The average content of the liquid manure was 0.338 per cent. of nitrogen and 0.635 per cent. of potash.

784 — **Action of Fermenting Manure on Reënforcing Phosphates.** — TOTTINGHAM, W. E. and HOFFMAN, C. (Agricultural Chemistry and Bacteriology Laboratories, Wisconsin Experiment Station, Madison). in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 3, pp. 199-209 + figs. 3. Easton, Pa., March 1913.

Considerable evidence has been accumulated which indicates advantage from the use of finely ground rock-phosphate directly as a fertiliser, especially when it is applied in conjunction with a liberal supply of organic matter. The work described in this paper includes studies of the action of fermenting manure on rock-phosphate or floats (rock-débris). The fresh manure free from litter (a mixture of $^1/_3$ horse manure and $^2/_3$ cow manure unless specified otherwise) was thoroughly hand-mixed with floats in the proportion of 1 lb. of floats to 50 lbs. of manure. The samples were fermented in covered iron pails; and water was added occasionally in the earlier experiments to maintain a fairly even moisture content of the check and reënforced manures.

Fermentation over periods of 4 to 6 months caused a decrease of water-soluble phosphorus in manures and mixtures of manures with rock-phosphate. The losses were greatest in the mixtures, where they amounted to more than one-half the soluble phosphorus originally present. Ammonium citrate solution and fifth-normal nitric acid did not recover this depressed phosphorus in all cases and hence other changes than simple reversion to insoluble phosphates apparently occurred.

Ammonium carbonate solution of the strength existing in the moisture of fermenting manure was no more efficient than water as a solvent for phosphorus in fermented manures and manure-phosphate mixtures. A saturated solution of carbon dioxide was not superior to water as a solvent for phosphorus in manures and mixtures which had fermented about two and one half months, and in which bacteria were active, but was superior when fermentation had covered 10 months and the bacteria had become practically inert. It was five times as efficient as water or the ammonium carbonate solution in solvent power for phosphorus of rock-phosphate. The addition of either chloroform or formaldheyde, which practically inhibited bacterial action, greatly reduced the losses of water-soluble phosphorus in mixtures of manure and rock-phosphate.

Dry bacterial cells of manure organisms grown on agar media contained 4 to 8 per cent. phosphoric acid. The growth of manure organisms upon media supplied with the soluble phosphorus of fresh manure rock-phosphate mixtures depressed the water-soluble phosphorus of the media by amounts which were comparable to the losses of water-soluble phosphorus observed in fermenting manures. About one-half the phosphorus of fresh intact bacterial cells was soluble in water. This phosphorus was apparently derived chiefly from inorganic phosphates absorbed from the media. The remaining phosphorus of the cells was probably present in nuclein compounds.

Acid-phosphate incorporated with the fermenting manure underwent essentially the same changes of solubility as rock-phosphate. In the presence of chloroform, however, the acid-phosphate decreased markedly in solubility, while with rock-phosphate no decrease occurred. Application of monocalcium phosphate to barley in pot experiments gave greater immediate returns when the phosphate was applied with previously fermented manure than when it was applied in a fermented mixture of manure and phosphate. The immediate returns from tricalcium phosphate were the same whether it was applied with previously fermented manure or in a fermented mixture. A second crop of barley from the original application of reënforced manures gave a superior yield from the fermented mixture for both phosphates.

In conclusion this work requires confirmation under field conditions before it can be applied to direct agricultural practice. However, so far as pot experiments indicate conditions in field experience, the final results from mixing rock-phosphate with fermenting manure appear to be advantageous. In the case of acid-phosphate it appears inadvisable to mix the material with fermenting manure. It is probably better practice to add it to the manure at the time of application to the field.

785 – **The General State of the Nitrate Trade in 1912 and in the Beginning of 1913.** BROWNE, A. G. (gerente interiao) in *Asociacion Salitrera de Propaganda, Circular Trimestral,* No. 59, pp. I - LIII. Iquique, April 15, 1913.

The following data, which complete those published by the International Institute of Agriculture in *Production et consommation des engrais chimiques dans le monde,* (1913), are taken from the last Report of the Directors of the "Asociación Salitrera de Propaganda" to its members:

	In 1912: tons	In 1911: tons	Difference: tons
Production according to the data communicated by the establisments	2 545 938	2 482 112	+ 63 826
Exportation	2 454 602	2 411 707	+ 42 895
Consumption	2 490 502	2 363 299	+ 127 203

The figures corresponding to the first six months of the "salitrero" year, July to December, were as follows:

	July 1 to Dec. 31 1912: tons	July 1 to Dec. 31 1911: tons	Difference tons
Production	1 329 610	1 255 281	+ 74 329
Exportation	1 429 821	1 432 404	— 2 583 in 1912-13
Consumption	749 906	659 114	+ 90 792 in 1912-13.

The stocks visible on December 31 were:

in 1912: tons	in 1911: tons	Difference: tons
1 594 357	1 667 657	6 604 304

As a complement to the above, the following are the figures dealing with the consumption in Europe during the months of February and March 1913, compared with those of the preceding year.

	in 1912: tons	1913: tons	Difference: tons
February	307 430	233 160	74 270
March	436 240	355 470	80 770
Smaller amount of consumption			155 040

According to the market reports of some of the principal firms this decrease of consumption is due to the insufficient quantity of nitrate of soda in the ports of delivery compared with the demand, which in its turn is caused by the slackening of transport by sea owing to the English colliers' strike of 1912

786 - **Cyanamide, Dicyandiamide and Nitrolime.** — DE RUIJTER DE WILDT, J. C. and BERKHOUT, A. D. (Rijkslandbouwproefstation te Goes) in *Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouw-proefstations*, No. XIII, pp. 61-116 + XXIX Tab. + app. The Hague, 1913.

This is a continuation of previous investigations with special regard to the chemical factors in the phenomena of the transformation of nitrolime. Pure cyanamide and dicyandiamide prepared from nitrolime were used.

In the investigations the cyanamide was determined by weight as a silver salt.

Stability of cyanamide in the dry state. — The titration of pure cyanamide kept for two years in a state of dryness diminished from 98.1 per cent. to 94.1 per cent.

Stability of cyanamide in solution. — Of two solutions of cyanamide in water, one containing 0.25 and the other 1 per cent, kept for fifteen months, the first may be considered as practically stable, only the titration of the second diminished somewhat, namely from 98.3 to 94.3 per cent. Solutions of about 0.5 per cent. were kept at normal temperatures, at 40° C. and at 60° C. for a month and a half; in the first case the solution kept almost unchanged, at 40° and 60° the transformation was more marked. A solution of 2 per cent. cyanamide concentrated to dryness on sulphuric acid for 9 days still contained 90.4 per cent. of the original quantity of cyanamide; the same solution boiled in an apparatus with refrigerator contained after 40 minutes 91.2 per cent. of the original quantity; lastly, evaporated almost to dryness over a water-bath it was transformed almost entirely into dicyandiamide.

Action of salts, acids and bases on cyanamide solutions. — A solution of 0.5 per cent. of cyanamide was treated for three years with $\frac{N}{50}$ solutions of sodium, ammonium, calcium and potassium chlorides, of sodium and ammonium nitrates, of ammonium sulphate and suspended calcium carbonate; only the calcium salts caused a sensible transformation into dicyandiamide; the presence of chlorides caused a diminution of the nitrogen in the silver salt. On experimenting for 7 months and under equal conditions with the three potassium phosphates it was found that a formation of dicyandiamide took place with bi-potassium phosphate and still more with the neutral salt. Lastly, experimenting for two months with solutions containing 0.5 and 1 per cent. of cyanamide and $\frac{N}{50}$ solutions of sulphuric, hydrochloric and nitric acids, ammonium, sodium and calcium hydrates, it was found that with the acids the formation of urea took place to the same extent, while the formation of dicyandiamide is more intense with the bases and especially with calcium hydrate; besides, it appears that the degree of concentration has more influence than the quantity of the bases and acids present; thus a very weak acid such as carbonic acid, after a month, had had scarcely any action.

The writers did not find any alteration due to surface tension or to oxide of iron. In this connection the eventual action of enzymes is to be investigated, as they might explain the conflicting opinions held on the toxicity of calcium cyanamide as a fertilizer.

Dicyandiamide. — The writers propose determining dicyandiamide by transforming it into guanilurea by the action of acids and then precipitating it as picrate. The solutions of dicyandiamide in themselves are stable; the transformation takes place quantitatively with an excess of acid, but a high degree of acidity is not favourable.

Behaviour of solutions of nitrolime and of lime-nitrogen. — The transformation into dicyandiamide was observed, and also that it was more rapid in concentrated solutions. The formation of ammonia was rarely observed in many years.

Behaviour of nitrolime and of lime-nitrogen (1) *in well closed vessels.* Of two commercial samples of nitrolime and of two of lime nitrogen, only two of the latter underwent sensible transformations, probably owing to the moisture they had previously absorbed. This shows the possibility of alterations taking place even in well closed vessels, and the writers conclude after several experiments that the alterations of nitrolime are due only to dampness and not to the action of carbonic acid.

Mixture with other fertilizers. — The following results were obtained by keeping in well closed flasks several samples and observing the quantity of ammonia that was absorbed by a titrated solution of sulphuric acid situated in small tubes within the flasks.

Losses of ammoniacal nitrogen in milligrams.

January 31, 1908	April 9 1908	July 31 1908	Dec. 7 1908	June 14 1909	Nov. 4 1909	Total
10 grams *nitrolime*	9.1	61.74	6,58	4.76	5.88	88,06
do + 10 grams water	70.28	12.32	12.32	8.54	9.52	112.98
do + 10 » potassium-magnesium sulphate	7.98	41.44	11.62	9.66	9.94	80,64
do + 20 grams kainit	20.02	35.42	8.4	8.68	10.22	82,74
do + 20 » superphosphate	0.14	20.44	27.72	19.46	19.18	86.94
10 grams *lime nitrogen*	14.84	32.34	5.6	5.74	7.0	65.52
do + 10 grams water	45.64	9.94	8.12	8.82	10.22	82.74
do + 10 » potassium-magnesium sulphate	10.36	30.24	7.84	7.7	9.24	65.38
do + 20 grams kainit	18,48	22.82	6,44	6.44	8.82	63,00
do + 20 » superphosphate	0,14	33.60	18.48	14.98	10,22	77.42

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(1) See INSTITUT INTERNATIONAL D'AGRICULTURE. *Production et consommation des engrais chimiques dans le monde,* 1913. (*Ed*)

At the end of these experiments all the nitrogen present was transformed into dicyandiamide; noteworthy is the increase of temperature when mixed with superphosphate, without however loss of ammonia taking place. In conclusion nitrolime may be mixed with the above fertilizers without fear of any loss of nitrogen, even if the mixture be made some time before using it. There is only the danger of retrogradation with superphosphates and consequently it is advisable to mix with kainit when nitrolime is to be spread some time before sowing.

Effects on germination. — The final results may be given of some experiments begun on July 13 with white mustard in cylinders containing respectively peaty, gravelly, sandy and loamy soils. They were calculated graphically on July 20 by multipying the number of well-developed plants by the average height. Except for the gravelly soil the highest index was obtained with nitrate of soda; next comes that of the untreated soils and of those treated with guanilurea which is only equalled or exceeded by dicyandiamide on loamy soil; then follow dicyandiamide and old and transformed nitrolime which behave almost alike; the least favourable results were those obtained by cyanamide and nitrolime which present about the same parallelism.

Pot-culture experiments. — The principal result of these experiments conducted in 1911 and 1912 with white mustard is that old and altered nitrolime has next to no useful effect, the eventual fertilizing action being balanced by its toxicity.

Conditions of sale. — Following on an understanding between the "Verkaufsvereinigung für Stickstoffdünger » of Berlin and one of the writers on behalf of the Dutch Experiment Station it was agreed that for Holland nitrolime was to contain at least 70 per cent of its total nitrogen under the form of cyanamide nitrogen with a margin of 5 per cent. This limit is easily exceeded in the factories and anyhow the effect of dicyandiamide nitrogen cannot be compared to that of cyanamide nitrogen. Attention is also drawn to the disadvantages due to the presence of calcium carbide.

The writers intend to continue their investigations.

787 - **Lime Rich in Silica as Manure.** — IMMENDORF, H. *Die Landwirtschaftlichen Versuchs-Stationen*, Vol. LXXIX-LXXX, pp. 891-901. Berlin, 1913.

The writer in a series of experiments with several calcareous materials containing from 0.03 to 19.51 per cent. of silica soluble in hydrochloric acid, on six loams containing from 17.90 to 36.18 per cent. of clay and from 53.07 to 75.97 per cent. of sand, did not find any of the inconveniences commonly mentioned by various writers. The conclusion which he draws is that manuring with quicklime containing silicic acid acts on the soil in the same manner as manuring with ordinary quicklime. The formation of cement-like concretions can be completely avoided by carefully spreading the lime on the soil and mixing it in well during favourable weather. Lastly it has been noted that the hydrated silicic acid that is formed has a beneficial action, since it increases the absorbent power of the soil.

788 - **The Relation of Lime to Magnesia in Soils.** — VOELCKER, J. A. (The Woburn Experimental Station of the Royal Agricultural Society of England, Pot-Culture Experiments 1910-11-12) in *The Journal of the Royal Agricultural Society of England,* Vol. LXXIII, pp. 325-338 + Plates 9-11. London 1912.

Continuation and conclusion of pot-culture experiments begun in 1906 on wheat:

a) in soil containing 0.40 per cent. of lime and 0.20 per cent. of magnesia with the addition of magnesia, and magnesia and lime, in various proportions;

b) in soil containing 0.83 per cent. of lime and 2,29 per cent. of magnesia with the addition of lime in various proportions.

The general conclusions of the writer are:

1. That magnesia may, with advantage to the wheat plant, be added to a soil poor in magnesia, so long as the amount of magnesia in the soil does not exceed that of lime.

2. That as the ratio of lime to magnesia approaches 1:1, a benefit will continue to accrue, but that if magnesia be in excess, a toxic influence will be exercised and the crop be diminished.

3. That soils in which magnesia is in excess of lime will not give fully satisfactory results as regards corn-growing, but will be benefited by the addition of lime.

4. That lime used in excess does not possess the toxic influence which magnesia similarly used has.

5. That magnesia and lime alike are capable of modifying the growth of the wheat plant, altering the nature and extent of the root development and the character of the grain. These modifications are mainly shown in the stronger and greener appearance of the flag, the production of a much developed and very fibrous root growth, and the greater assimilation of nitrogen, resulting in the obtaining of a more glutinous grain.

The writer gives the results of a field experiment.

On a plot 36 sq. feet in extent divided into two equal parts, one of which, contained 0.77 per cent. of lime and 0.20 per cent. of magnesia and the other 0.77 per cent. of lime and 0.40 per cent. of magnesia, Squarehead's Master wheat was grown in 1910-11, but as the crop was destroyed it was resown and the following results were obtained:

	Grain lbs.	Straw. lbs.	Percentage of nitrogen in grain
With 0.20 per cent. of magnesia .	2	4 1/4	1.77
» 0.40 » »	3	6 3/4	2.17

The commercial value of the grain obtained from the plot with 0.40 per cent. of magnesia was estimated at 1s 6*d* per quarter more than the other.

789 – **The Influence of Lithium, Zinc and Lead Salts on Wheat.** — VOELCKER, J. A. (The Woburn Experimental Station of the Royal Agricultural Society of England, Pot-Culture Experiments, 1910-11-12: Hills' Experiments) in *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 314-325 + Plates 1-8. London, 1912.

These investigations are a continuation and conclusion of pot experiments on wheat, the first of which was made in 1898 with lithium salts; in 1909 experiments were begun with salts of zinc, and in 1912 with salts of lead.

The first and principal conclusion drawn from these experiments is that the presence in the soil of quite small quantities of what are termed the « rarer constituents » has a far greater influence on vegetation than has hitherto been supposed.

As for the results special to each substance it was found:

a) Lithium:

1) That in the form of any of its salts it produces a toxic effect if it is present in the soil to the extent of 0.003 per cent. or above.

2) That the toxic effect is greater the more lithium there be present and that the form of nitrate is the most toxic.

3) That when present in the soil in an amount not exceeding 0.002 per cent. lithium possesses a stimulating influence.

4) That among all the salts of lithium, the nitrate would seem to be the most stimulating salt and to produce the best results when not in excess of 0.001 per cent.

5) That the action of the salts of lithium on vegetation is exerted mainly in the early stage of the germination of the seed.

b) Zinc.

1) That its salts when present in the soil in amounts exceeding 0.02 per cent. produce a toxic effect; below this quantity they possess a slightly stimulating influence, more noticeable with the more soluble salts and especially with the nitrate.

2) The toxic and the stimulating influences of zinc are about one tenth those of lithium.

c) Lead.

1) That when it is present to the extent of 0.03 per cent. it does not possess any toxic influence upon vegetation; on the contrary the nitrate, with that amount present, would seem to possess stimulative properties.

2) That further experiments are needed to determine the amounts that can be safely or advantageously used.

The writer lastly considers it necessary that similar researches be now extended to other crops in order to ascertain whether, as upon wheat, minute quantities of certain metallic compounds exercise an action capable of bringing about changes in their development, root formation and even in the nature of the grain produced.

790 - **Annual Report for 1912 of the Consulting Chemist.** — VOELCKER, J. A. in *The Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 276-283. London, 1912.

Amongst the questions relating to the control of fertilisers and feeding stuffs, the writer refers to *a*) the use of sawdust — in its raw or prepared condition —as a constituent of feeding cakes or meals; *b*) the so-called solubility of basic slag. He considers that sawdust is not a proper material to use for stock, while the question of the solubility of basic slag still remains unsolved. He calculates further that the fertilizing value of hop bine which is lost when the latter is carted off the land instead of being burnt and spread in the form of ashes is 6*s* 6*d* per acre.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

791 - **Studies in Nitrogen Nutrition in Plants.** — POUGET, I. and CHOUCHAK, D. in *Annales de la Science Agronomique*, Year 30, No. 4, pp. 281-302. Paris, April 1913.

The following experiments were carried out with eight different soils, — A to H — each of which was distributed in 6 pots. The pots contained 3.8 kilograms of soil. Two in each series received in addition a sufficient quantity of potassium phosphate, potassium chloride, and calcium nitrate to supply 1 gr. of P_2O_5, 1 gr. of K_2O, and 1 gr. of N respectively; three others received the same dressing without the nitrate, and of these two were used for measuring the crop while the other was used for soil sampling; the sixth pot of the series remained uncropped and served as a control for estimating the nitrification going on in the soil. A moisture content of 18 per cent. was adopted in the earlier stage of the experiment, and later increased to 21 per cent. as the weather got hotter; it was maintained by means of a daily watering on a balance. Millet seedlings were planted on February 27th. On April 30th one third of the crop in each pot was harvested and the soil was sampled at the same time. On June 6th the remainder of the crop was harvested, fully mature, and the soil was again sampled.

In every case the plants receiving nitrate produced bigger crops, the increase varying with the different soils, and the duplicates agreed very well together. Taking the crop with nitrate as 100 in each series, the crops without nitrate were as follows:

Soils	April Harvest	June Harvest
A	18.9 %	20.6 %
B	14.7	14.4
C	47.0	19.7
D	28.6	17.9
E	61.3	37.2
F	43.5	63.3
G	83.5	80.9
H	56.0	43.4

The total nitrogen in the soils does not vary much and could in no way account for the varying effect of the nitrate application.

The process of nitrification in the soil receiving no nitrate was followed by analysing samples drawn from the uncropped pot at the start and at the time of the two harvests. No considerable accumulation of nitric nitrogen took place in any of the soils, and in G, which was the only one with a fair amount of nitrogen to start with, denitrification actually occurred.

Soil	Total per cent.	Nitrogen in parts per million					
		At the start		April 30		June 6	
		Ammonia	Nitrate	Ammonia	Nitrate	Ammonia	Nitrate
A	·13	2.1	5.2	4.5	7.4	8.3	9.1
B	·08	0.9	2.5	1.7	2.4	4.8	0.0
C	·13	11.5	5.1	8.7	16.2	6.6	20.4
D	·12	6.3	3.2	3.4	9.9	3.1	15.0
E	·11	9.0	16.8	5.4	15.0	4.0	18.4
F	·16	12.0	10.3	3.4	23.5	7.1	23.5
G	·11	7.1	37.4	20.2	26.4	4.9	20.8
H	·06	8.9	15.1	6.1	12.5	7.6	15.2

The writers attribute this to the daily watering which they consider sufficient to saturate the soil and inhibit nitrification. They were unfortunately unable to analyse the April crop, but assuming that it contained only 3 per cent. of nitrogen, the nitrogen content of the crop was greater in every case than the sum of the nitric and ammoniacal nitrogen in the uncropped pot, from which they concluded that the plants must have been able to absorb the organic nitrogen directly. Their conclusion was confirmed by some field observations at Algiers, where nitrification is frequently temporarily inhibited by heavy spring rains without impeding the activity of the vegetation in any way.

Again, though no correlation could be established between the production of nitrates and the yields obtained, the writers show that there exists a distinct relation between the total soluble nitrogen in each soil and the yields. The total soluble nitrogen was estimated by two methods: in the first 100 gr. of soil were put into a glass tube of about 1 inch diameter, and water was allowed to percolate through it continuously. Every 24 hours the percolate, which amounted to about 60 cc., was collected and analysed. The amount of nitrogen going into solution diminished rapidly for the first few washings, and after that tended to remain constant, indicating a state of equilibrium between the reserve of nitrogen in the soil and the water. In order to investigate further this so-called point of limited concentration, 4 gr. of soil was treated with 1 litre of water to which a few drops of chloroform had been added to stop bacterial action, and left in contact for a week with an occasional shaking. In this way it was found that the more soluble portions were all removed in the first washing and a state of equilibrium then attained. The writers have shown in previous works that the growth of plants varies with the concentration of the solution in contact with their roots (1).

With regard to the nitrogen supply in an unmanured soil, the plant growth should be at first in proportion with the total "available" nitrogen, *i. e.* that which goes into solution in the first few washings, but when this becomes exhausted the plants would depend on the solubility of the reserve or in other words on the point of limited concentration. In the experiments under consideration the April harvest should therefore be determined by the total available nitrogen, while the June harvest should be influenced rather by the limited concentration point. The results are given below :

	Total available parts per million	Point of limited concentration parts per million
A	27.0	0.184
B	16.8	0.160
C	28.8	0.165
D	21.2	0.162
E	82.4	0.190
F	55.2	0.215
G	188.5	0.140
H	78.1	0.210

The agreement is good and in the June harvest the only big discrepancy is soil G, which, as mentioned before, had an exceptionally large nitrate content at the start which probably carried it through the growing period.

792 - **The Effect of Artificial Shading on Plant Growth in Louisiana.** — SHANTZ, H. L. in *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 279, pp. 1-29. Washington, April 1913.

Two long wooden frames, each 24 by 6 feet, were covered by sections of cloth of five different textures which reduced the light intensity within the frames to ½, 1/5, 1/7, 1/15, 1/93 of the normal respectively. A sixth section was left uncovered and there were no partitions between the sections. One of the frames (A) was further provided with an electric fan but the variation in temperature and humidity between the two frames proved to be very small. In the two months (April and May) during which the experiment was running, about 70 per cent. of the possible sunshine was recorded.

Maize, potatoes, cotton, radish, mustard, and lettuce were used for the trials, and measurements of the green weight per plant, of the height, and of the diameters of the stems were taken after 30 days, and again after

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(1) See No. 235, B_1 March 1913. *(Ed.)*

50 days when the experiment was discontinued. The relative green weights per plant were as follows :

Light intensity	$\frac{N}{1}$		$\frac{N}{2}$		$\frac{N}{5}$		$\frac{N}{7}$		$\frac{N}{15}$		$\frac{N}{93}$	
Frame	A	B	A	B	A	B	A	B	A	B	A	B
After 30 days												
Maize	100	100	77	94	55	45	30	32	8	5	2	0
Potato.	100	100	129	57	130	54	168	33	65	26	34	33
Cotton.	100	100	60	92	68	123	114	49	23	31	12	12
Radish	100	100	108	68	79	77	63	48	50	88	0	0
Mustard	100	100	70	99	72	123	69	77	16	16	0	0
After 50 days												
Maize	100	100	62	94	84	46	47	7	35	0	0	0
Potato.	100	100	238	146	139	250	282	160	44	27	28	23
Cotton	100	100	223	178	91	177	63	31	18	10	0	0
Radish	100	100	228	107	157	119	103	55	3	1	0	0
Lettuce	100	100	129	107	124	107	106	147	4	9	0	0

During the first period of the experiment, growth was on the whole distinctly better in full light, while in the second period only maize shows up as a sun-loving plant. The growth of the other plants increases with shading even when the light intensity is reduced to $\frac{N}{7}$.

Similar experiments are now being carried out in Colorado in relation to drought resistance investigations in the semi-arid portions of the United States.

793 - **The Resistance Offered by Leaves to Transpirational Water Loss.** — LIVINGSTON, B. E. in *The Plant World*, Vol. 16, No. 1, pp. 1-35. Baltimore, Jan. 1913.

The writer elaborated a method of measuring the relative rate of transpiration in plants by means of standardised cobalt chloride paper and a free water surface, the results being stated in terms of the free water surface and called the "index of transpiring power". The method was checked by means of readings from two atmometers and hourly weighings of sealed potted plants, which though not absolutely confirmatory showed considerable agreement, but only two sets of readings are available for comparison on which to base the reliability of the new method. Results of several field trials are given and indicate that the method should prove of great value in ecological studies, but many more tests will have to be carried out before any reliable generalizations may be attempted.

794 – **Natural Root-Grafting.** — HOWARD, A. in *The Agricultural Journal of India* Vol. VIII, Part II, pp. 185-189. Calcutta, April 1913.

The harmful effect of trees on the surrounding vegetation is well known to cultivators in India, who recognise that some species do more damage than others, and when the botanical area of the Pusa Experimental Station was laid out, an attempt was made to limit the effect by digging a deep trench each year between certain trees and the adjacent cultivated area. In the case of bamboos and of certain other trees this was quite successful, but in other cases, for instance with pipal (*Ficus religiosa*), banyan (*Ficus benghalensis*) and teak (*Tectona grandis*), negative results were obtained, and when thin patches of the crop were examined in the surrounding land, tree roots were found under the surface up to 217 feet distant from the parent tree. The old trenches were carefully opened up in 1912, and it was found that the severed roots had become connected again. New roots had been formed at the cut extremity, they had grown across the width of the trench, which was 24 to 30 inches, and united with the severed portion of the root by a process of natural grafting followed by a rapid thickening of the connection which attained a thickness of 0.8 to 1.1 inches in 12 months. Moreover a trench 6 feet deep proved insufficient to intercept all roots, apart from their faculty of reuniting, for the roots of the pipal and banyan, which may be 10 to 12 feet deep in the immediate vicinity of the tree, will come to the surface again further off and enter into competition with the crop.

PLANT BREEDING

795 – **Experiments in Wheat Breeding: Experimental Error in the Nursery and Variation in Nitrogen and Yield.** — MONTGOMERY, E. G. — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* 269, 61 pp. Washington April, 1913.

The data obtained in the wheat breeding experiments carried out during the 5 years 1905-1910 at the Nebraska Agricultural Experiment Station have been gathered together for the purpose of determining the experimental error in the nursery stage, *i. e.* the stage at which selections are usually made.

The standard plot adopted at the above station is the « centgener », a plot 5 feet square containing 100 plants 6 inches apart each way; but single rows and larger plots are also used.

In the first part of the bulletin the writer considers the experimental error in relation to the nitrogen content of the grain.

Individual plants in 10 adjacent centgeners and in 10 corresponding lines of 100 plants each, were analysed and the results were grouped in various ways, as were 2-foot sections of a 220-foot drill, also longer rows of 16 feet and small plots 5.5 feet square. The results show that wheat plants under nursery conditions vary considerably in their nitrogen content, the limits being in one case from under 2 % to over 5 %, but the variations are not inherited and must therefore be due to environment; moreover this variation is not restricted to individual plants, but occurs also, though to a less extent, when centgeners, rows, or small plots are taken as units. The best means of reducing the experimental error proved to be to take a small unit, and make a large number of determinations; for example: single plants 40 determinations; 16-foot rows 5 to 10 determinations and centgeners 8 to 16 determinations; and the method finally adopted as being the most practical for comparing strains on the basis of their nitrogen content consisted of rows 12 to 16 feet long repeated 10 times in different parts of the field.

In the second part of the bulletin the writer treats of the experimental error in relation to yield, which is usually the factor of primary importance in the production of new varieties. As in the previous part of the paper various sized rows and plots were considered and grouped together in different ways. When 16-foot rows were adopted it was found necessary to repeat them 10 to 20 times, and the greater the number of strains the greater the number of repetitions required on account of the increased area occupied by the trial. Small blocks, 5.5 feet square, on the other hand, repeated only 8 to 10 times gave equally accurate results. Increasing the length of the row or the size of the block decreased the variability, but not to the same extent as repeating the unit measurements, and in all trials it was found most important to have control plots interspersed amongst the others to be used for determining the experimental error before the value of differences observed amongst the other varieties could be estimated. Though there were some exceptions, on the whole high yield in the nursery was correlated with high yield in the field, and this was specially true when small blocks were taken as the nursery unit, the reason for this probably being that in that case the methods of sowing were exactly similar; while, in the ordinary centegener the equal spacing of the plants might introduce a fresh factor, and in the case of single rows competition between adjacent rows might introduce another source of error.

796 - **Studies of Natural and Artificial Parthenogenesis in the Genus Nicotiana.** — WELLINGTON, R. in *The American Naturalist*, Vol. XLVII, No. 557, pp. 279-303. New York, May 1913.

An attempt to produce parthenogenetic seed in the genus Nicotiana by means of the stimulus caused by foreign pollen, by mutilations, by fumigation, or by infections. Several hundred trials were made, but no unquestionable case of seed production was obtained.

797 - **On the Behaviour of Wheat subjected to the Action of Copper Sulphate Solutions of Different Concentrations.** — LESAGE, P. in *Bulletin de la Société Scientifique et Medicale de l'Ouest*, Vol. 21, No. 3, pp. 129-132. Rennes, 1912.

Wheat grains were steeped in solutions of copper sulphate varying in strength from 31 to 40 per cent. and for times varying from 1 to 195 hours. The vitality of the seads was not seriously depressed in solutions up to 10 per cent. so long as the grain was not left in the solution more than a few hours. But at the same time it was observed that moulds also developed in solutions up to 10 %, so that the effectiveness of copper sulphate dressings for seed grain, which are usually carried out with 1 to 2 per cent. solutions, becomes very questionable. At the same time the writer points out that in drying the grain subsequenty to the steeping, the solution left on the surface of the seeds may become sufficiently concentrated to be toxic to mould spores.

CEREAL AND PULSE CROPS

798 – **Wild Wheat in Palestine.** — COOK, O. F. — *U. S. Department of Agriculture Bureau of Plant Industry, Bulletin* 274, 56 pp. Washington, April 1913.

Following on the discovery of a new wild wheat by M. Aaron Aaronsohn, director of the Jewish Agricultural Experiment Station at Haifa, Palestine, the writer was instructed in 1910 to make further investigations of the subject. The present bulletin includes an exhaustive study of the plant in its native habitat and shows that normally it is a cross-fertilized species. It is widely distributed on the Anti-Lebanon range of mountains in northern Palestine and Syria, and is specially abundant on limestone formations. Its behaviour suggests the possibility of acclimatization in the south-western portion of the United States, where it may be of value both for crossing purposes and as a fodder plant, and trials are being carried out to that effect.

FORAGE CROPS. MEADOWS AND PASTURES

799 – **Sudan Grass, A New Drought-Resistant Hay Plant.** — PIPER, C. V. *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 125, 20 pp. Washington, May 1913.

Seed of the grass *Andropogon halepensis* was imported into the United States from the Sudan in 1909, and has been tried in Texas and other parts of the semi-arid zone. The grass yields well in specially dry seasons and the fodder is much appreciated by stock. Large quantities of seed are now being grown and the crop promises to be a valuable acquisition to dry land farmers.

FIBRE CROPS

800 – **Projected Revival of the Flax Industry in England.** — VARGAS EYRE, J. in *Science Progress*, Vol. VII, No. 28, pp. 596-628. London, April 1913.

The cultivation of flax in England has always been subject to rather wide fluctuations, and though as late as 1870 23 957 acres were under the crop, the area gradually declined, and has been quite insignificant since 1896, the markets being supplied by Russian fibre. Of late years, however, the linen industry in Russia has developed enormously, and it is now able to deal with all the best quality fibre produced in that country, so that prices have risen to almost twice their value of ten years ago and the possibility of reintroducing flax as a remuneratve crop in England has received the attention of the Commissioners appointed under the Development Act. To this end the writer was appointed in 1911 to gather first-hand information about the crop by studying its cultivation in Russia, Holland, Belgium. France, Ireland, Austria-Hungary and Germany. Moreover, certain field experiments were conducted last year in Bedfordshire, where, besides raising the crop, retting experiments were made in tanks specially constructed for the purpose.

A Report of the enquiry was made to the Commissioners, who kindly gave their consent to the publication of the above article which summarises the document.

The Report leaves no doubt that the climate and soils in many parts of England, notably in Yorkshire and Somerset, as well as in the Midland and Eastern counties, is well adapted to the production of high quality fibre, and though its cultivation is somewhat more troublesome than that of ordinary farm crops, no difficulty should be encountered in that connection provided that practical information can be placed at the disposal of the farmers. In order to produce high quality fibre, the process of retting and scutching requires skilled labour which could not be supplied by ordinary farm servants, and it seens advisable that it should be undertaken by specialists; the all important question is, then, whether the after treatment of the crop can be dealt with in such a manner that remunerative prices can be offered to the farmers for growing the crop. The general evidence is undoubtedly favourable, but only practical trials can afford definite knowledge, and recommendations for the establishment of one or more small retting depots, each capable of dealing with the produce of 100 acres, were made in the Report. The gain to British agriculture, should the experiment prove successful, is held as an ample justification for the expenses that would be incurred. The recommendations were favourably received by the Commissioners, and a society has been formed under strict conditions of non-profit trading in order that it may be eligible for a grant under the Development Act.

The Bedfordshire trials in 1912, alluded to above, were made to include trials of varieties of seed procured in Russia and in Holland and the effect of adding muriate of potash at the time of sowing. Though care was observed not to select exceptionally favourable soil, the crops generally were good. Some difficulty was experienced in getting the crop weeded and pulled, but the villagers displayed some anxiety to do their best and their services became more useful as they became more familiar with the work. Female labour in the fields was abundant. Attempts made to construct a filter bed for purifying the effluent from the retting tanks, though not altogether successful, indicated that the method might eventually prove useful, and further trials will be carried on during the present season. It is hoped at the same time to conduct some more systematic experiments with a view to gaining experience for the subsequent establishement of a small retting station.

801 — **Cotton in Egypt and the Anglo-Egyptian Soudan.** *Official Report International Federation of Master Cotton Spinners' and Manufacturers' Associations*, pp. 1-347. Manchester, March 1913. — DUDGEON, G. C. in *Bulletin of the Imperial Institute*, Vol. XI, No. 1, pp. 90-101. London, January-March 1913.

At the October meeting of the International Cotton Committee in Berlin in 1911 it was decided to send Mr. Arno Schmidt, the Secretary of the International Federation of the Master Cotton Spinners' and Manufacturers' Associations, to Egypt to prepare an itinerary for a tour of investigation by members of the Federation; and, as a result, Mr. Arno Schmidt visited Egypt at the end of the year and wrote a very valuable report of his visit. In October 1912 the International Congress met in Egypt, where they had the opportunity of holding important discussions with various representatives of cotton-growing interests in Egypt. The delegates moreover decided that Mr. Arno Schmidt should proceed to the Anglo-Egyptian Sudan and report on that country with a special view to its possibilities with regard to the production of cotton. The reports of Mr. Arno Schmidt's two journeys, together with that of the visit of the Congress, and an appendix containing original articles by various technical experts, a few official documents relating to the matter treated, and some useful cotton statistics, are published in the above volume and form a valuable contribution to our knowledge of the Egyptian cotton question at the present day.

The deterioration of the Egyptian cotton crop formed the basis of a large number of the discussions. The decline in yield is a very real one and cannot be attributed to the fact that fresh lands are being used for the production of cotton which are less fertile than the older ones, for on old estates the decline is equally evident. The loss of quantity has been the subject of much complaint amongst spinners for some time past.

The causes for this deterioration are numerous. Amongst the most important may be mentioned the mixing of varieties: as cross pollination is a very usual phenomenon in the cotton plant the introduction of a few seeds of an inferior grade very soon begins to affect the bulk and, together with the complete lack of appreciation of the necessity for any seed selection by the native cultivator, has undoubtedly had an important share in the reduction of both yield and quality. Another set of causes may be grouped together under the heading of bad cultivation and are chiefly due to the difficulty of educating the fellah. By long use, agricultural procedure has become a part of the people themselves, and even with altered circumstances the necessity of reforms or modifications is rarely recognised. For instance, the difficulty of obtaining sufficient Nile water is such an established principle, that the possibility of using too much is hardly considered, and as a consequence the cotton fields suffer from over watering. This, together with the practice of planting too closely and not caring properly for the interspaces, stifles the crop and tends to its deterioration; moreover the close foliage thus obtained forms an admirable protection to the insect pests, the severity of whose periodical visitations has been a marked feature in the last decade. The crop, too, now appears twice in the rotation of three years instead of once as formely. Lastly, the raising of the level of the water in the canals, together with the absence of natural drainage, has been conclusively proved to cause waterlogging of the soil and asphyxiation of the plants.

With such a list of noxious influences the wonder appears to be rather that the plant could exist at all than that the yield and quality had been reduced; but with a thorough appreciation of the gravity of the position, far-reaching remedial measures have been inaugurated, the effects of which will probably make themselves felt before long.

In the first place, a Botanical Laboratory and Plant Breeding Station has been established at Giza under the direction of Mr. W. L. Balls, where much valuable research work has already been done, and with this as a source of new varieties specially adapted to the conditions of the country the Government have undertaken their propagation and final distribution of the seed to the farmers under the most favourable terms. For some time past the best and purest seed in the country has been obtainable from the State Domains, but only the larger farmers availed themselves of this supply. The Government is now taking up the distribution amongst the smaller farmers and it is further suggested that the State should make the sale of cotton seed a licensed trade in order to prevent altogether the disposal of inferior seed. The Government too has established a number of demonstration farms to educate the fellah in the matter of cultivation, and these have been so successful that they are being repeated in all parts of the country.

With regard to the insect pests a Commission has recently been appointed to study the subject thoroughly. It is hoped that they may find a means of checking the ravages of the pests by the introduction of an internal parasite of the cotton worm such as exists in India, where the cotton worm is a common insect but has never been observed as a pest on the cotton crop.

The question of drainage too is occupying much attention ; a great scheme for the relief of those areas in the Delta which suffer most has now been commenced by the Government but will take many years to complete. The chief difficulty lies in the low level of the land and the necessity of lifting the water to higher levels by means of a pump in order to get rid of it. At the same time, now that the raising of the Assuan dam has provided the necessary water supply, the new drainage system will also make it possible to reclaim large areas of salted land in the lower part of the Delta.

In the Sudan, the cotton-growing districts may be considered under four headings :

I. *Flood Irrigation.*

This includes the Tokar district where 50 000 feddans (1) are under cotton and the Kassala district where 4 000 feddans are under cotton. They are watered by the flood water of the Khor Baraka and the Gash respectively. Both these rivers come from the mountains of Abyssinia and Eritrea, and are in flood from July to September, at which period only they reach the sea. The water thus obtained, together with a rainfall of about 6 inches per annum, is sufficient to raise a cotton crop which averages about 400 lbs. of seed cotton per acre, but which can easily be raised to 700 lbs. of seed cotton with a little care. Cultivation is very primitive and the fact that the rivers have a habit of flowing in different districts from year to year does not encourage the cultivators to prepare their land in advance. Only the best quality cotton is grown by the natives and the seed is supplied by the Government who also exert a controlling influence on the Tokar market by having an official classifier for grading the crop. With a proper control of the flood water large areas of suitable land could be brought under cultivation, but railway communications must also be established before the districts can be developed.

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(1) 1 acre = 0.936 feddan.

II. *Pump Irrigation.*

This is practised in the districts north of Khartoum where the climate is not particularly well adapted to cotton. Plantations are still almost in an experimental stage and the Zeidab estate of 10 000 feddans run by the Sudan Plantation Syndicate is the most flourishing example.

III. *The Ghezira.*

This district consists of the triangular piece of land betwen the Blue and the White Nile south of Khartoum. Here the rainfall gradually increases as we go south and the climate generally is more favourable to cotton than in the district north of Khartoum. A great irrigation project has been formulated by Sir William Garstin for establishing a barrage at Sennar on the Blue Nile and cutting a canal from there parallel to the Blue Nile to a point about 40 miles south of Khartoum. This would eventually lead to the irrigation of 1 000 000 acres at an estimated cost of £6 000 000. In the meantime a test farm was started 2 years ago at Tayiba where about 2 000 acres are now irrigated by means of a pumping station. The management of the farm has been given to the Sudan Plantation Syndicate who had the experience of their other plantations to guide them and were able to induce trained farmers to come from Zeidab and teach by their example the inhabitants of the Ghezira the proper way of growing cotton. The experiment has been a complete success. Natives are clamouring to be allowed to become tenants and the cost of producing cotton is very little higher than in America. It would seem advisable before embarking on the main irrigation scheme to repeat these test farms in two or three other parts of the Ghezira in order to be quite certain that other soils are equally suitable and to ascertain through actual experience the cost of excavating the channels in the various parts of the Ghezira, and, at the same time, to educate the inhabitants in cotton growing and to await an increase in the population to take up the holdings.

IV. *Rain Grown Cotton.*

Suitable districts for this form of cultivation occur south of Sennar and in the southern portion of the Kassala province. The methods of cultivation are very primitive and only American varieties flourish. So far about 1000 tons of this kind of cotton are produced annually but the possibilities of extension are said to be very great.

In conclusion it may be added that in the debate which followed the reading of the King's speech at the opening of the British Parliament in March 1913, the Right Hon. H. H. Asquith, Prime Minister, said : « I may say, as to the Sudan loan, that the maximum amount we propose to ask is £3 000 000 in instalments, and I believe that prospects of its development are such as to afford ample security. »

804. — **Egyptian Cotton Culture in the Southwest (United States).** — SCOFIELD, C. S. in *U. S. Department of Agriculture, Bureau of Plant Industry*, Circular No. 123, pp. 21-28. Washington, April 26, 1913.

Extensive trials of Egyptian cotton were made in irrigated districts of Arizona and California during the season 1912. Seed was distributed to 75 farmers and about 530 acres were planted. The yield per acre varied from 400 to 700 lbs. of lint, which fetched the same price as imported Egyptian, and the results in general appear to justify further trials on a still larger scale.

OIL CROPS

803 - **Ground-Nut in Gujerat.** — SANE, C. V. in *The Agricultural Journal of India*, Vol. VIII, Part II, pp. 178-184. Calcutta, April 1913.

A short article showing that the cultivation of ground-nuts, after having first been tried at the Government Farm, Surat, is slowly extending over South Gujerat. The crop is liable to damage by birds, beasts and thieves, and the cost of cultivation and harvesting are very high; but good yields up to 2 600 lbs. per acre are obtained, and the possibility of large profits may induce cultivators to adopt it as a regular crop in their rotation.

VARIOUS CROPS

804 — **The Nicotine Content of Hungarian Tobaccos.** — TOTH, GYULA *Magyar Dohánynjság*, Year XXX, No. 9, 5 pp. Budapest, May 5, 1913.

The continuation of a series of experiments regarding the nicotine content of Hungarian tobaccos (1). The writer effected the complete extraction of nicotine from tobacco leaves destined exclusively for the Hungarian factories.

Hungarian tobaccos are mostly not manufactured till two or three year after the leaves have been gathered. The writer has found that the nicotines content of the leaves diminishes during this time, a fact which is especially advantageous in the case of these tobaccos from the consumer's point of view, as the original amount of nicotine present is very large.

The writer examined first and third class tobaccos of the following varieties from the crops of 1907 and 1910: Debreczen, Tisza, Szeged, fine garden, semi-fine garden, Muskatály and common tobacco. The samples having been taken from nearly all the districts supplying the Tobacco Department, the data obtained can be generalised.

Table I shows the nicotine content of the different varieties.

TABLE I.

Variety	No. of samples examined	Minimum %	Maximum %	Average Content %
Debreczen	24	1.8	4.5	3.0
Muskatály	25	1.7	5.3	3.1
Tisza	16	2.5	4.6	3.8
Semi-fine garden	65	0.5	3.6	1.6
Szeged	13	1.4	6.2	3.7
Common	5	1.4	5.9	4.3

Hitherto the diminution of the nicotine content during the keeping of tobacco was a mere hypotheses.

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(1) See *Magyar Dohánynjság* Nos. 17 and 11, 1911. (*Author's note*)

Table II gives the nicotine loss in 12 samples of tobacco analysed at different dates.

TABLE II.

Variety and Quality	Nicotine per cent. at the beginning of the experiment	Nicotine per cent. after 6 months	Nicotine per cent. after one year
Szeged I	2.2	2.2	2.2
Tisza I	4.6	4.4	4.4
Tisza I	4.2	4.0	4.0
Muskatály I	4.4	4.1	3.7
Semi-fine garden I	1.9	1.6	1.6
Debreczen I	4.4	4.4	4.4
Muskatály III	2.2	2.2	2.1
Debreczen I	4.2	3.9	3.9
Semi-fine garden III	1.1	1.1	1.1
Muskatály	3.1	3.1	3.1
Semi-fine garden	1.6	1.5	1.5
Common III	1.4	1.4	1.4

These results show that tobacco kept for a long time in a dry place may lose a certain proportion of its nicotine content.

805 - **Economic Results of Cultivating Heavy Tobacco Crosses Resistant to *Thielavia basicola*.** — AIELLI DONNARUMMA in *Bollettino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto Sperimentale in Scafati (Salerno)*, Year XII, No. 2, p. 89 + figs. Scafati, March-April 1913.

A supplement to the observations published in No. 5 of the above-mentioned periodical for 1911 and No. 6 for 1912 (1). The economic results obtained in cultivating tobacco in the Province of Salerno are given in a table. While the Kentucky variety there only yields a gross return of about £ 24 per acre, the heavy crosses (Italia × Kentucky, Salento × Kentucky, Moro × Kentucky) yield a gross return of from £ 28 to £ 35 per acre. This result is the more important, seeing that this type of tobacco is also superior from an agricultural and an industrial point of view.

806 - **Observations on the Preparation of Cacao.** — PERROLI, E. in *Comptes rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 18, pp. 1394-1396. Paris, May 5, 1913.

The cacao which finds its way to the European markets from the countries where it is produced undergoes fermentation after being gathered. The conditions of this process are as yet undetermined, with the result that the cacao-making industry has to deal with an extremely variable product. The operation has the double aim of destroying the sweet mucilaginous pulp which adheres closely to the seeds of the fruit, and to produce useful chemical changes in the kernel.

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(1) See No. 234, *B.* Jan. 1912, and No. 520, *B.* May 1913. (*Ed.*).

In a first series of studies, undertaken with the object of making the preparation of cacao more systematic and less difficult, the writer found that the method at present in use could be modified with advantage by using a mechanical process for removing the pulp after a preliminary treatment of the fruit with a weak alkaline solution: The fresh seeds are macerated for some hours at a temperature of 45° to 50° C. in a 1 per cent. sodium carbonate solution and are then left in a warm, damp spot until the pulp has undergone sufficient transformation. Unfortunately, this process gives every opportunity for the growth of moulds, and for this reason the writer has undertaken new investigations with a view to sterilizing the fresh seeds.

By the simple action of steam under slight pressure in an autoclave, seeds were obtained which after the pulp had been removed mechanically presented an excellent appearance. The flesh of the kernel retains its beautiful violet colour after desiccation, showing that the tannic compounds had undergone no chemical change. The sterilized seeds were reduced to powder and then subjected to two kinds of tests, the one of a chemical, the other of a biological nature. From these it was concluded that it is possible to obtain changes in this sterilized powder in the laboratory which are comparable to those in the course of the present method of preparation as practised in the countries where the cacao is grown and that the latter would derive considerable benefit from the adoption of the new process.

807 – **New Kitchen Garden Plants** (1). — DUBOIS P. in *La Vie Agricole et Rurale* Year 2, No. 23, pp. 671-673. Paris, May 10, 1913.

MARKET GARDENING

Very long Aubergine, Perfection. — Very hardy and early as well as unusually productive. Each plant (about 3 ft. in height) bears 15 to 20 fruits, up to 12 inches long and 2 to 3 inches in diameter; the fruits are nearly cylindrical, of a fine dark violet colour and travel well.

Improved white Cardoon. — This is distinct from other varieties on account of its very wide, thick, full, tender, fleshy ribs, which, so to say, whiten of their own accord; vigorous, hardy, and without spines.

Improved Saint Fiacre Carrot. — A good variety as regards fine flavour, shape and colour; it is the result of long continued selection of the ordinary Saint-Fiacre variety and belongs to the short, red, early type.

Cauliflower, Marvel of All Seasons. — This variety has a short stem and green foliage, is erect and regular and resembles the half-hard Paris variety. Its large heads, nearly covered by the leaves, are very white and fine, and close-grained in texture. Their quality is excellent and their development very rapid. The early growth of the head makes this variety suitable for forcing, while as it resists not only spring frosts but also excessive heat in summer it is equally adapted to planting in the open.

Early Cabbage, King of the Markets. — One of the earliest summer cabbages. The head is large, round and very firm, rising from amidst, fine, glaucous, rounded foliage.

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(1) See No. 374, *B.* April 1913. (*Ed.*).

Improved Rochford Cucumber — The favourite variety in England. The foliage is abundant and the plant produces a quantity of fruit with firm flesh, and of a delicate green, recalling by their shape the Improved Telegraph Cucumber, but with more prominent spines.

Green Water-Melon from Tripoli (*non-running*). — This variety, which is very common in Egypt, has straight, elongated, well-shaped fruits, which when completely developed are of a uniform dark green. The plant is vigorous and very prolific, has divided leaves, and is resistant to heat.

Extra-early dwarf "Mangetout" Haricot with green seed. — This variety presents the same advantages as the extra-early dwarf white Mangetout, but in addition, produces a green seed like that of the green kidney bean, if properly dried in the shade before being completely ripe.

Red winter G. N. Lettuce. — These lettuces, though small, produce heads of a nice shade of green tinged with copper colour, and are crisp with an excellent flavour. They pack and travel well.

Marteau Turnip for forcing. — Very early, has little foliage and grows rapidly, being thus especially adapted for first sowings under glass, as an early vegetable, or for late sowings. The shapely clean very white root resembles in shape the Marteau form of the Des Vertus turnip. Its flesh is fine and sweet.

Colossal Virgin Sorrel. — Has remarkably large leaves, still larger than those of the Blonde Lyons.

Express Mangetout Pea. — A half-tall variety (3 ft. 6 in.) producing abundance of fine large pods; very early.

Mammoth wrinkled dwarf Pea. — Early, coming in immediately after the very early varieties; produces a large number of pods.

Wrinkled tall pea, Sensation. — The result of a cross between Alderman and Edwin Beckett. This new hybrid resembles both its parents in habit, and like the first is remarkable for its resistance to heat and for its productiveness. The strong, solid stems are provided with ample foliage, and attain a height of about 5 ½ feet. They are covered with pods, usually in pairs, 6 to 7 inches long, very full and containing 11 or 12 large green sweet melting peas of excellent flavour, which remain tender even if picked when almost ripe. A mid-season variety.

Oval white summer Radish. — The root is smooth, very clean, and well-shaped; the flesh is fine, and very full and has an excellent flavour; as the roots do not become hollow early, they need not be eaten till they are nearly fullgrown. This variety does not split, even in very wet weather.

Dwarf extra-curled parsley, Perfection. — The leaves are very fine and curly.

808 – A Comparison Between the Cuttings of Grafted and Ungrafted Vines (1).

FRUIT-GROWING

— BACO, F. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 15, pp. 1167-1169. Paris, April 14, 1913.

The writer has shown in a preceding paper that " Grafting does not preserve absolutely the characters of the associated vines forming respectively the stock and the scion.

" There are cases where modifications of these characters are observed or the reciprocal transmission of certain other characters, which are regarded by writers on vine-growing as primordial or definitely acquired. Any particular character possessed by a hybrid can be accentuated or diminished, that is to say systematically modified, by grafting on suitable stocks (2) ".

In continuing his investigations, M. Baco proposed to discover whether variations thus obtained persist, or increase, in propagation by slips, and whether they are accompanied by changes in the root system.

On February 10, 1911, ten slips as similar as possible were taken from each of eight types mentioned later (two controls and six subjects of experiment); variations in these vines had been observed in the writer's experiment field at Bélus (Landes).

The vines were planted separately in good, friable, homogeneous soil and at the same depth; they were left for 2 years without other care than hoeing, and the spraying necessary for keeping them in good health; all the vines were treated alike. The writer determined, chiefly in 1912, and in particular on August 28 and October 20 of that year, that the characters acquired by means of grafting had persisted; in particular, those of colour, habit, vigour, leaf-fall, and resistance to mildew. On up-rooting the vines on January 28, 1913, M. Baco further found that the parts below ground had undergone changes in accordance with those of the parts above ground.

Plants derived from grafts showed the following differences from those taken from ungrafted vines:

Ungrafted Baroque. — Roots going deep (35°), fleshy, with rootlets.

Baroque from graft on 1202. — Roots going somewhat deep (55°), fleshy and fairly rich in rootlets.

1202 *from graft on Baroque.* — Roots spreading (70°), very fleshy, with rootlets.

1202 *from plant on its own roots.* — Root going somewhat deep (54°), very fleshy, and rich in rootlets.

Baroque from graft on 157^{11}. — Roots somewhat spreading (60°), fleshy, and with many rootlets..

Baroque from graft on Rupestris du Lot. — Roots going somawhat deep (50°), very fleshy and very plentifully supplied with rootlets.

Baroque from graft on 3309. — Roots somewhat spreading (65°), fleshy, very rich in rootlets.

Baroque from graft on 101^{14}. — Roots going somewhat deep (55°), somewhat fleshy, and with many rootlets.

From these experiments "it may be concluded that, in the cases of the grafted Baroque and grafted 1202 at Bélus, as well as in those of this Vinifera grafted on 157 ¹¹, Rupestris du Lot 3309, and 101 14, certain specific variations due to grafting have proved to be transmitted by slips, and that the modifications of the parts of the plant above ground have been accompanied by important specific changes in the root system ".

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(1) See No. 138, *B.*, Feb. 1913. (*Ed.*).

(2) F. BACO, *Sur des variations de vignes greffées.* — *Comptes Rendus*, Feb. 15, 1909. (*Ed.*).

809 – **Late Pruning.** — RAVAZ, L. in *Le Progrès Agricole et Viticole*, Year 30, No. 17, pp. 517-518. Montpellier, April 27, 1913.

The following table gives the results obtained in 1912 at the Montpellier School on a plot of vines devoted to the determination of the influence of the pruning time upon vegetative phenomena.

No. of Row		Destroyed eyes %
9	Pruned in September, after the vintage	37.70
10	Pruned on the fall of the leaves	74.00
11	Pruned the end of December	61.00
12	Pruned when the sap began to rise	31.50
13	Pruned at the opening of the buds	4.80
14	Pruned when the shoots were 5-6 cm. long	0.00

The following tables give the wood and fruit production.

	Weight of wood per vine in ounces								
	1905	1906	1907	1908	1909	1910	1911	1912	Average
Row 9	11.5	18.0	22.0	14.0	14.4	16.8	21.2	23.9	17.7
» 10	11.7	21.2	21.6	19.6	26.2	29.0	28.9	28.6	23.4
» 11	11.1	16.3	23.2	16.6	20.3	23.5	21.2	23.7	19.5
» 12	13.7	16.7	19.4	16.5	18.4	24.1	21.1	22.6	18.7
» 13	13.8	18.9	18.9	15.9	21.2	23.4	19.1	23.4	18.8
» 14	14.8	17.4	17.8	19.7	23.1	21.2	21.4	26.9	20.0

Thus, the latest pruned row always takes a good place.

	Number of bunches per vine					
	1908	1909	1910	1911	1912	Average
Row 9	12.15	17.2	16.7	15.3	12	13.72
» 10	12.45	14.6	18.8	18.1	15	14.44
» 11	14.85	18.6	16.7	17.4	13	15.30
» 12	14.55	19.8	19.7	20.0	12	17.22
» 13	18.30	20.5	19.4	19.6	14	18.54
» 14	14.55	17.7	18.1	26.1	19	19.60

	Production per vine in ounces							
	1906	1907	1908	1909	1910	1911	1912	Average
Row 9. . . .	47.0	149.9	143.3	92.1	96.0	64.7	38.2	90.1
» 10. . . .	27.8	145.0	125.6	152.8	143.0	80.3	78.8	107.6
» 11. . . .	36.2	120.3	109.2	107.8	124.5	67.8	55.5	88.8
» 12. . . .	44.5	134.4	141.1	134.4	136.9	40.8	82.3	107.3
» 13. . . .	40.3	168.0	141.1	120.7	131.8	83.5	74.2	108.8
» 14. . . .	55.7	157.7	147.7	125.4	123.4	102.8	62.2	110.7

In order to make the data complete, the production per vine is given, but the figures for 1912 are of no value, as all the rows were tested by an artificially caused attack of mildew.

810 – **Planting Northern Vineyards and Forcing-Houses with the Assistance of American Stocks.** — PROSPER, GERVAIS in *Le Progrès agricole et viticole*, Year 30, No. 21, pp. 648-657. Montpellier, May 25, 1913.

Phylloxera still continues its devastating course, for though its progress has been somewhat checked in the Northern and North-Eastern districts, where the climate is cold and damp, this does not prevent the systematic destruction, and the undoubted disappearance of old vineyards. And then there will arise in those districts, if it has not already arisen, the question of whether it is well to replant the vanished vineyards, of the conditions under which this could be done, together with the means and methods to be adopted to carry out the work.

The writer considers that the reconstitution of northern vineyards is wonderfully simplified by the use of American stocks or their hybrids, on account of the undoubted advantages accruing from grafting, *viz.* earlier maturity, and increased yields of better-developed and improved fruit.

The satisfactory results of grafting should be seconded and completed by the choice of the grafts. These should be carefully selected and have reached the first stage of maturity. It would be well further to choose only white varieties.

The stocks which seem most suitable to the soils and climates in question are: the Berlandieri hybrids (Vinifera-Berlandieri, Berlandieri × Riparia); the Riparia hybrids (Solonis × Riparia, Riparia × Rupestris); the hybrids of Cordifolia (Cordifolia × Riparia, Riparia × Cordifolia-Rupestris, Solonis × Cordifolia-Rupestris,); these are preferable to Rupestris du Lot and to hybrids of Vinifera × Rupestris, whose well-known faults should prevent their being used.

The building of forcing-houses and the cultivation under glass of American stocks, or hybrids, will open up new resources, and bring the vine-growing industry the elements of true progress, of development, and of continued prosperity.

811 - **Horticultural Research: the Action of Grass on Trees.** — PICKERING, S. in *Science Progress*, Vol. VII, No. 28, pp. 490-503. London, April 1913.

The harmful influence of grass on fruit trees varies considerably with the nature of the soil and the method of treatment. Young trees planted in land already grassed or put down to grass immediately after planting suffer most, while if grass is merely allowed to establish itself slowly in an older plantation the effect seems to be reduced to a minimum. But the action is a perfectly general one, and with one single exception has been observed in all parts of England and in all classes of soil. The visible effect is not confined to stunted development, but is manifest too in the altered colour of bark, leaves and fruit.

Numerous possible causes of these changes have been investigated, foremost among which are lack of water and plant food owing to the competition of the grass. Trees under grass were watered by means of tubes so that the soil in contact with their roots was moister than the adjacent tilled soil, and observations taken one season showed that the moisture content in soil under grass was never reduced below the optimum point, yet in both cases the trees were obviously less healthy than similar trees in tilled soil. In other experiments carried out in pots the grass roots were prevented from coming in contact with the tree roots by a sheet of fine gauze placed about 4 inches below the surface, and plant food was supplied from below, yet even under these conditions the trees suffered from the grassing. Added to this, the general conclusions that trees in tilled soil do better in dry years than trees in grassed soil in wet ones, also that soil under grass is usually richer than tilled soil, dispose of the water and food supply as possible causes. Feeding the grass with sheep does not improve matters, and the effect of keeping poultry in grass orchards is now being investigated. Mechanical analyses of the soils failed to reveal any contributing cause, nor was the effect simulated when the soil was made alkaline. Lack of aeration would not appear to be of importance from a consideration of the iron drum experiments described in a previous article (1) and of the fact that trees were grown in a soil artificially enriched with carbon dioxide without disturbance, and it is equally impossible to make differences in temperature between grassed and tilled soils account for the phenomenon. Finally, bearing in mind all the available evidence, the writer was led to the conclusion that the action must be due to some *toxic effect*, using the term in its wider sense to mean the presence of some poisonous substance in the soil, without defining its direct source; this hypothesis is certainly confirmed by the following experiment: trees were planted in pots, the surface of which was covered by moveable perforated trays on which the grass was grown. In spite of the complete separation of the grass from the tree roots, the growth was reduced by 25 per cent; when, however, the drainage from the grass was collected and left exposed to the air some time previously to being used on the tree, the effect was beneficial. These results indicate that the trees suffer by reason of something added to rather than removed from the soil, also that by oxidation the toxin is converted into plant food.

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(1) See No. 378, *B.* April 1913. (*Ed.*).

Now when a soil is heated, the amount of soluble organic matter it contains is increased, and at the same time the soil becomes toxic to germinating seed. Both these effects are considerable at 150° C., but diminish with the temperature; they are still recognisable at 60° C. and probably begin to operate at 30° C. A similar effect is obtained when a soil is treated with antiseptics, and the toxic substance decomposes gradually if the soil is aerated and moistened, but remains unaltered for several months if air is excluded from the soil; the rapidity with which the toxin is formed indicates that it is a direct and unstable product of chemical reaction. The soluble organic matter also decreases with time, but not as rapidly as the toxin, so that when the latter has completely disappeared some excess of the soluble organic matter is left over and accounts for the increased fertility of the treated soils. Tomato and tobacco plants grown in soil heated to 30°, 60°, 80°, 100°, 125°, and 150° C. respectively clearly showed the effect of these two opposing factors; after a preliminary check the plants grown in the soils heated to the lower temperatures recovered and were able to profit by the increased nitrogen supply, but when the soil had been heated beyond a certain point, the check was too prolonged and the plants never caught up lost time, so that it required a second crop to show the effect of the increased nitrogen supply. The results varied a little according to the sensitiveness of the plants, but on the whole the results justify the conclusion that the oxidisable substance which is toxic to seeds is also toxic to plant growth. In order to extend the experiments to trees, the aeration of the soils was restricted by enclosing them in bottles, and under these conditions the toxic effect of those heated to 125° and 150° C. became noticeable.

Coming back to the question of grassing, a somewhat analogous case is presented when soil is first uncovered by the removal of grass; it does not behave normally at once, but after exposure to the air becomes more favourable to plant growth than ungrassed soil, owing to the presence of a larger amount of nitrogenous and organic matter. The resemblance between the behaviour of grassed and heated soils is shown in yet another manner: owing to the presence of some oily or waxy substance heated soils are more difficult to wet than unheated soils, and this peculiarity is reproduced to a lesser degree in grassed soils. On the other hand grassed soils have never proved toxic to germinating seeds, so that the connection between the two cases is not established, though they undoubtedly have some points in common.

The writer is unable to accept Russell and Hutchinson's hypothesis of protozoa as the limiting factor in soil fertility, for on this hypothesis a maximum fertility should be obtained by heating soils to 50° C., at which temperature protozoa are killed with least injury to bacteria. He points out that his experiments do not confirm this view; but, he adds, on the other hand if the process is a purely chemical one resulting in the formation of a toxin it seems difficult to believe that the plant food liberated by heating a soil to 100° C. would be sufficient to account for the extra vigour of plants. He concludes by saying that “ both explanations are probably correct but neither alone affords a full explanation of the facts ”.

812 – **The Plum Industry in Servia.** — STOYKOWITCH, W. in *La Vie Agricole et Rurale*, Year 2, No. 21, pp. 616-619. Paris, April 26, 1913.

The importance of plum cultivation. — Plum growing and the various industries connected with it form a very important source of the revenue of Servia. Plums, under different forms, are exported annually to the value of nearly a million sterling.

Plums occupy a much larger area in the country than any other fruit trees, and are especially grown in the West and Centre of Servia, particularly in the departments of Kraguyévatz, Valyévo, Podrinye, Rudnik, Chachak, Ujitzé and Kruzhévatz. The following figures give an idea of the importance and the development of plum cultivation in Servia :

Year —	Area under plums acres
1889	157 750
1900	251 000
1906	326 500
1911	346 500

By far the most widely grown variety is Projegatcha (Lorraine plum). The trees are usually propagated by means of suckers taken from below the trees in old orchards ; after planting they are left to themselves, but there is a marked tendency towards more systematic cultivation.

The prosperity of plum growing is entirely due to the plum industries in Servia. About two-fifths of the total crop is dried, one-fifth is made into preserve, while the remaining two-fifths are used for the manufacture of plum brandy (“ rakia ” or “ shlivovitza ”), with the exception of a very small quantity exported as fresh fruit, chiefly to Germany ; these are the finest fruits hand-picked before they are quite ripe. The home consumption also is included in the last-mentioned two-fifths.

The prune industry. — This industry is much developed and is very prosperous, Servian prunes being celebrated abroad. The somewhat primitive drying apparatus, the “ puchnitza ” (a kind of baker's oven), and Glavinitch's oven, hitherto employed, are about to be replaced by a very much better apparatus which has been selected from the exhibits of many oven competitions organized by the Government.

The principal plum markets are held daily (except Sunday) from the 1st of September (old style) to the end of November, in the following towns: Belgrade, Shabatz, Kraguyévatz, Valyévo, Chachak, Obrenovatz, Arandjelovatz and Loznitza. The Servian Government takes special measures throughout the plum season to prevent the sale of damaged or inferior fruit, and to prevent fraud. The prunes are sold by weight and also according to the number per pound. They are sorted in the salesmen's store rooms by means of sorters with sieves of different dimensions. The classification of prunes adopted in the Servian trade is, in general, as follows:

60-65	fruits	per	pound	"Chestizè"
70-75	»	»	»	"Sedmitzé"
80-85	»	»	»	"Osmitzé"
95-100	»	»	»	"Stotinké"
115-120	»	»	»	"Usance"
120-130	»	»	»	"Mercantil"

The exported prunes are dispatched in sacks containing 130 to 180 lbs. or in boxes of 26 to 55 lbs. In the latter case, the prunes are placed in the oven after packing, as in the common French method. Prunes are chefly exported to Austria, Germany, Belgium, Holland, Denmark, England, Switzerland and Russia. They form an important article of commerce: the exports amounted to between 40 000 and 50 000 tons from 1904 to 1908, then fell to 9 000 in 1909, and were respectively 23 500 and 32 750 tons in 1910 and 1911; the highest value in the ten years 1902 to 1911 was in 1911, *viz.* £654 500; it was nearly the same in 1907, and over £400 000 also in 1906, 1908 and 1910.

The manufacture of plum preserve. — This jam is made of completely ripe plums, without the addition of sugar. The fruit is first cooked, in order that the skins and stones may be more easily removed, and is then boiled in special cauldrons 7 to 10 ft. wide and 24 to 28 in. deep. The cauldrons are heated over an open fire, as better results are obtained by this means than by steaming (as at Kraguyévatz). The prepared jam is placed in receptacles holding 12 to 15 gallons and exported abroad, chiefly to Austria and Germany. The exports averaged 13 000 tons from 1902 to 1908, then fell to 1 500 in 1909 and were 9 300 and 5 100 in 1910 and 1911 respectively; the greatest value in the 10-year period was in 1907 (£170 000), while in 1910 and 1911 it was £112 800 and £8 600 respectively.

The most important markets for plum jam are: Kraguyévatz, Chachak and Shabatz.

The manufacture of plum brandy. — Only fruit of inferior quality is distilled and that in very primitive apparatus; two kinds of brandy are made, one called "meka shlivovitza" (or mild) scaling 20° to 30°, and another called "liouta shlivovtza" (strong) or "prépétchénitza" (redistilled brandy) scaling 40° to 50°. Only the latter is exported abroad.

The exports of plum brandy (including a little pomace brandy) varied between 600 000 and 800 000 lbs. from 1903 to 1909, and in 1910 and 1911 were respectively 200 000 lbs. and 57 500 lbs.; their value reached over £4 000 in 1905, but was only £630 in 1911.

813 – **The Grafted Papaya as an Annual Fruit Tree.** — FAIRCHILD, D. and SIMMONS, E. *United States Department of Agriculture, Bureau of Plant Industry*, Circular 109, 13 pp. Washington, March 1913.

The Papaya or Papaw (*Carica papaya*) is a tropical fruit somewhat resembling a small melon and possessing a characteristic flavour. The leaves and unripe fruits contain the ferment papain. Hitherto its cultivation in Florida, where the fruit is much appreciated, has been impeded by the fact that its propagation from seed gave very uncertain results, while its propagation from cuttings was too slow to prove remunerative. One of the writers has now been successful in grafting desirable stock on young seedlings, so that a yield of 48 to 72 lbs. per tree may be obtained in 15 months. There are indications that the demand for papayas is growing and that the smaller fruits can be shipped to distant markets with success.

FORESTRY

814 – **The Extraction of Resin from Pines in Corsica.** — DE LAPASSE in *Revue des Eaux et Forêts*, Vol. 59, Part II, pp. 321-334. Paris, June 1, 1913.

The forest conditions of Corsica may be summarized as follows:

Classification according to ownership.

Forests beloging to the State		115 724	acres
» « to Communes	subject to State easements	210 476	»
	not subject	29 979	»
» » to Private Owners		74 780	»
	Total	430 959	»

Of this area, 326 200 acres are subject to State easements. Considering that 84 264 acres are bare, the really wooded area is 346 695 acres, or 16 per cent. of the total area; to which about 741 330 acres of bush (maquis) have to be added.

Classification according to forest trees.

Evergreen oak	98 127	acres	or	28	per cent.
Corsican pine	89 281	»	»	25	»
Maritime pine	72 576	»	»	23	»
Beech	47 593	»	»	12	»
Cork oak	7 436	»	»	3	»
Various	31 680	»	»	9	»
Total	346 695	»	»	100	»

As the above table shows, resinous trees prevail; of these the Corsican pine, almost always alone, forms the greatest stands of the island at from 3300 to 5 000 feet above sea level, while the maritime pine is met with at altitudes ranging from 330 to 3300 feet, but chiefly between 650 and 2600 feet.

Hence the eventual importance of the extraction of resin from these 161 800 acres of resinous woods.

The extraction of resin from the Corsican pine was begun in 1856 and actively pursued until 1867, during which time it was favoured by the

American civil war. The following account, which gives the yield of 8 seasons from 1869, shows the economic aspect of the industry:

Turpentine.	262 347	lbs.
Colophony	282 807	»
Tar	476 035	»
Total . . .	1 241 189	»

Referring this total production to the 45 921 trees utilized yearly, the yield per tree is 3.377 lb., the net returns per tree being 0.57 *d.*

Considering the consequence of the extraction of resin from a cultural point of view the following chief drawbacks have been observed.

1. The failure of the wounds to heal when tapping without killing the tree is practised (gemmage à vie).

2. Difficulty of extracting resin by tapping to death, and injury to the wood.

3. Difficulty of combining the extraction of resin with selection felling, which is the best for Corsican pine.

The tapping of Corsican pine being abandoned, the extraction of resin from the maritime pine began in 1900. Several concessions for felling combined with tapping to death and tapping without killing the trees were granted by the State and by the Communes. In 1912 the total production of raw resin in Corsica was 54 045 gallons. Among the producers of resin the "Térébenthine française" Company deserves to be mentioned.

The management by selection felling has to be harmonized with the industrial tapping of maritime pine for resin. The writer believes the problem might be solved by a selection system "en damier," that is dividing the forest into regular stands of graduated age, but in no fixed order, each of which would be succcessively submitted to thinning, preparatory or seeding felling and final cutting.

In conclusion, the extraction of resin from the maritime pine may be considered as established in Corsica, but in order that the tapping over the whole of the 72 576 acres under maritime pine should be as satisfactory as that conducted by the French Water and Forest Service, the three following essential conditions must be borne in mind:

I. Labour must be introduced from abroad.

II. The means of communication must be good so as to render the day's yield profitable.

III. The tapping installations must be sufficiently near each other and conveniently grouped, for the same reason.

LIVE STOCK AND BREEDING.

YHGIENE

815 – **The Action of Arsenical Dips in Protecting Cattle from Infestation with Ticks.** GRAYBILL, H. W. — *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* No. 167, 27 pp. Washington, April 15, 1913.

In this bulletin, the writer discusses the factors entering into the efficacy of dips used against the ticks which infest cattle. Dips act both in a direct destructive way and in a protective manner. The protective result may be in the nature of a destructive or a repellent action. The influence of dips on oviposition and the viability of the eggs is a factor in efficacy.

Mr. Graybill's investigations were directed to ascertaining the manner in which dips act on ticks, and in the introduction he gives the different components of arsenical dips and discusses the probable effect of each. His experiments proved conclusively that the protective action of arsenic is due to the larvae being killed and not to their being repelled. This prophylactic action is, however, of short duration ; it is very noticeable for two days, but ceases after five.

The cases of arsenical poisoning which occurred in one experiment were probably due to the presence of undissolved arsenic in the dip.

816 – **The Reciprocal Relationship between Husk in Sheep and in Deer.** — RICHTERS, E. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 11, Part 5, pp. 251-269. Berlin, May 5, 1913.

The writer investigated which species of strongylus are found in the lungs of sheep and of deer and how the relative embryos and sexually mature parasites differed from each other. The strongyli found in sheep were *Strongylys filaria* Rud. (*Dictyocaulus filaria*) and *Strongylus commutatus* (*Synthetocaulus commutatus*). The number of the former averaged 95 per cent., that of the latter 5 per cent. In many hundreds of lungs examined by the writer no other species were found. The sexually mature worms occurred either in the tracheae or in the bronchi, never in the lung tissue. The male of *Strongylys filaria* Rud. has an average length of 30 to 55 mm. and a breadth of 0.4 to 0.5 mm., with a long lobed pouch or bursa; its posterior appendices are three-branched, the others are double. The speculae have membranaceous wings. The females are 45 to 90 mm. in length and 0.4 to 0.6 in width; the posterior extremity is pointed, the uterus symmetrically situated in both halves of the body; the eggs containing developed embryos are of a longish oval shape provided with hyaline shell, 129 to 138 μ, long and 74 to 85 μ broad. The embryos have a dome-shaped enlargement at the anterior extremity, the tail end is short ; length of the embryos from 267 to 360 μ, width 14.8 to 18.5 μ. Both males and females possess an oesophagus with bell-shaped mouth piece ; the mouth is naked and the skin is ribbed longitudinally.

As for *Strongylus commutatus*, the writer states it to be a species by itself. Contrary to hitherto accepted opinions, however, *Strongylus capillaris* (*Synthetocaulus capillaris*) and *Strongylus rufescens* (*Synthetocaulus rufescens*), which have been found in sheep, appear to be identical.

The lungworms found in deer are exclusively *Strongylus micrurus* Mehlis (*Dictyocaulus viviparus*). Neither *Strongylus filaria* Rud. nor *Strongylus sagittatus* or any other species has been found in the hundred cases investigated. The writer describes *Strongylus micrurus* Mehlis as follows: Skin without longitudinal ribbing, mouth with chitin ring, oesophagus long and slender. Length: male 35 to 32 mm., female 40 to 77 mm.; breadth 0.4 to 0.6 mm. The male has a small closed bursa. The posterior appendices are three-branched, the anterior ones double and the middle ones simple. The ends of all the appendices are clubshaped, and the spiculae have no membrane wings. The heads of the embryos in the uterus are without a hood; the embryos living free in the bronchial mucus are provided with caudal appendix and pointed end. The length of the embryos is 240 to 320 μ, their breadth 15 to 19 μ.

It thus appears from the researches of the writer that the lungworms of the sheep are distinctly different from those of the deer. He considers the transmission of strongylosis from sheep to deer as unlikely.

817 – **Investigations on the Toxin of Ascarids.** — WEINBERG, U. and JULIEN, A. in *Hygiène de la Viande et du Lait*, Year 7, No. 5, pp. 225-244. Paris, May 10, 1913.

After careful investigations of the perienteric secretion of the ascarids, sclerostomae and taenia found in the intestine of the horse, the authors have come to the following conclusions:

1. — That the perienteric secretion of *Ascaris megalocephala* acts injuriously not only upon animals submitted to experiment in the laboratory, but also upon horses. The above ascarids' secretion contains a toxin.

2. — If this secretion be dropped into the eyes of a horse, the secretion causes, in two thirds of the cases, a local reaction: swelling of the eyelids, inflammation of the conjunctiva, and running of the eyes.

3. — In severe cases the local reaction is accompanied by dyspnoea, diarrhoea and perspiration.

4. — In the course of 12 to 24 hours the inflammation of the eyes disappears; generally its intensity diminishes 2 to 3 hours after the introduction of the liquid into the eye.

5. — The effect of the toxin is various. Some worms have strong toxins and others weak ones; in all cases their presence can be proved even in dilutions of 1 : 5000 by their action on the eyes of horses.

6. — The perienteric secretion owes its virulence not to one substance only but to several; according to Flury's investigations its poisonous nature is due to aldehydes, fatty acids and their esters.

7. — The toxin is very resistant to heat; it passes through Chamberland filters and dissolves partially in alcohol and ether. Its volatile components are also toxins.

8. — The blood of horses affected by ascarids contains antitoxins which neutralize weak solutions of ascarid toxin. If the secretion be dropped into the eyes of such horses generally no reaction takes place.

9. — Among the other parasites found in the intestines of horses only the sclerostomae produce a poisonous secretion; dropped into the eyes of horses this produces only a slight inflammation.

818 – ***Nuttallia* and *Piroplasma* causing Piroplasmosis of Equidae in Transcaucasia.** — DSCHUNKOWSKY, E. and LUHS, T. (Cattle Pest Serum Station, Surnobat) in *Parasitology*, Vol. 5, No. 4, pp. 289-306. Cambridge, January 1913.

The writers give in this paper a description of all the cases of piroplasmosis which they have observed in the Equidae, and establish in agreement with the most recent opinions on the subject, the presence of several kinds of piroplasmosis in Transcaucasia. The article is accomapnied by two plates, which give different stages of the parasites : *Nuttallia equi* (Laveran), *Piroplasma caballi* (Nuttall,) the mule *Nuttallia* and *Nuttallia asini* (Dschunkowsky et Luhs); a bibliography of 37 works is appeanded.

819 – **Salvarsan in the Treatment of Surra in Horses, Dogs and Rabbits.** — HOLMES, J. D. E. in *Memoirs of the Department of Agriculture in India, Veterinary Series*, Vol. I, No. 2, pp. 88-148. Calcutta, January 1913.

These investigations were carried out at the Pusa Experiment Station. The memoir consists of three parts, which deal with the treatment of surra in horses, rabbits and dogs respectively. In each case mention is made of previous experiments made with arsenious oxide, atoxyl, soamin, arsacetin, orpiment and potassium antimony tartrate. The results of intravenous, subcutaneous and intramuscular injections of salvarsan in various amounts are described. They brought about a disappearance of the trypanosomes for long periods, but the treatment with salvarsan in not to be recommended in the case of horses or dogs.

820 – **Persistence of the Virus of Hydrophobia in the Ground and exposed to the Air, and Resistance to Cold.** — KONRADI in *Zentralblatt für Bakteriologie und Infektions-Krankheiten*, Vol. 68, Part 5-6, pp. 483-493. Jena, April 16, 1913.

The writer placed some rabbits which had died of rabies in different temperatures and at different depths in the ground, as well as on the surface and in places where they would decompose naturally, and after some time had elapsed made inoculations with the spinal marrow of these animals. The results were as follows : The virus remains active in dry, black, loam soil at a depth of 3 ft. for five weeks, on the surface between + 2° C. and + 16° C. for three months, between + 16° C. and + 25 °C. for 67 days, between + 7° C. and — 17° C. for 78 days and between 0° C. and + 8° C. for two months. Decomposition of the rabbits seemed to weaken the power of the virus.

821 – **Tuberculous Poultry the Cause of Tuberculosis in Pigs.** — BANG, OLUF in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 5, pp. 215-223. Berlin, May 5, 1913.

The writer deals with some special cases of spontaneous tuberculosis in pigs, which occurred in the last few years on Danish farms and were investigated by him. Dissection always revealed local tuberculosis of the glands of the digestive tract (tubercles the size of a hempseed in the spleen, liver, etc.) which however had no injurious effect upon the health of the animals. Fowls fed upon, or inoculated with, the substance of these glands, regularly developed tuberculosis, but guinea-pigs treated remained immune. Young pigs, on being fed on the flesh of tuberculous fowls, immediately became themselves affected by the disease. The writer considers that, in the above mentioned cases, the tuberculosis was due to the presence of the bacilli of avian tuberculosis, and believes, from the results of experiments, that by inoculating a living pig with fowl tuberculin it can be determined whether the animal is suffering from the avian or mammalian form of the disease. The writer attributes about 10 per cent. of the cases of tuberculosis in Denmark to the agency of the bacilli of the avian type.

822 – **Avian Tuberculosis.** — HASTINGS, E. G. and HALPIN, J. G. in *The University of Wisconsin Agricultural Experiment Station, Bulletin* No. 28, pp. 249-271. Madison, March 1913.

Avian tuberculosis has been prevalent in Europe for many years, but has usually been considered a relatively rare disease in America.

Since 1906 though a considerable number of avian tissues showing the presence of tuberculosis have been sent to the Wisconsin Station. After touching briefly upon the distribution of the disease and mentioning the bibliography on the subjest, the writers deal with its characteristics, the way in which birds are infected, the spread of tuberculosis amongst hens and its transmission from flock to flock. The writers give an account of their studies of the avian tubercle bacillus, of their experiments in the infection of other animals, and of their researches concerning the relation of this disease to swine tuberculosis. They also discuss the identity of avian and mammalian tubercle bacilli and the significance of avian tuberculosis in connection with the hygiene of man.

823 – **The Anatomy of *Argas persicus*.** ROBINSON, L. E., and DAVIDSON, I. in *Parasitology*, Vol. 6, No. 1, pp. 20-45 + figs. Cambridge, April 17, 1913.

The writers treat of the subject wth much detail and the text is elucidated by numerous good illustrations.

ANATOMY AND PHYSIOLOGY

824 – **Researches into the Amount of Manganese Present in the Bodies of Animals.** — BERTRAND and MEDIGRECEANU in *Annales de l'Institut Pasteur*, Vol. 27; Year 27, No. 4, pp. 282-288. Paris, April 25, 1913.

The writers made a chemical examination of 40 animals of different species, and were in every case able to isolate manganese, though the amount present was much less than in the case of plants. Among vertebrates, the mammals had the least manganese (only a few hundredths of a mg. per 100 gr. of live weight). Birds, fish, frogs and reptiles had from five to ten times as much. Molluscs, which are the richest invertebrates in manganese, contain a few mg. per 100 gr.

825 – **The Effect of Intestinal Poisons (Paracresol and Indol) on the Central Nervous Systems of Animals.** — WLADYCZKO, S. in *Annales de l'Institut Pasteur*, Year 27, Vol. 27, No. 4, pp. 336-340. Paris, April 25, 1913.

Owing to a suggestion made by Prof. Metchnikoff, the writer attempted to ascertain the effect of paracresol and indol upon the central nervous system of animals. Every other day for 7 days first 1 cc., and later, 2 cc., of 2 per cent. paracresol were introduced into the stomachs of 10 rabbits and 18 guinea-pigs. At the same time, 12 rabbits received first 1 cc. and afterwards 2 cc. of 2 per cent. indol (in olive oil) every other day for 63 days, also introduced into their stomachs. At the end of the experiment the surviving animals were killed, the nervous system was carefully examined and compared with that of control animals. The results were as follows: All the rabbits which had been treated with paracresol and with indol showed a certain degeneration of the blood vessels of the brain and injury to the nervous plexust of hat organ, though sometimes the effects were not well defined and the injury to the plexus was in proportion to the degeneration of the blood vessels. In the spinal marrow, the blood vessels were only affected in $^2/_3$ of the rabbits examined. Paracresol appears to have had no injurious effect upon the central nervous system of the guinea-pigs.

FEEDS AND FEEDING

826 - **The Employment of Whole Milk and of Corrected Skimmed Milk in the Rearing of Calves and Pigs.** — (From the Zootechnic Institute of the Royal Veterinary College of Budapest). WELLMANN, OSCAR in *Kiserletügyi Kozlemenyek*, Vol. XVI, Part. 2, pp. 118-240 + 27 tables. Budapest, March-April 1913.

The writer, who is Professor of zootechnics at the Veterinary College, has made a series of 22 experiments lasting 213 days on a calf and 9 young pigs fed on whole milk and corrected skimmed milk. He investigated the digestibility of these substances, their transformation into albumen, and their value as sources of energy.

The correction of the skimmed milk was effected by the addition of wheat and rye flour, or else of flour starch sweetened with "diafarine". Homogenized milk, in which a preparation of beef suet called "first gravy" was used as substitute for fatty matters, was also fed. Not having a respiratory chamber the writer controlled the fat and meat production of the animals resulting from the transformation of albumen and of energy by analysing the flesh of the animals slaughtered at the end of the experiments. But as this method proved incomplete, two control animals, belonging to the same litter as the subjects of the experiment, were killed at the beginning of the experiments and their organs analysed; the same was done to three of the experiment animals after the experiment.

The summary of the results obtained was as follows:

Skimmed milk to which sweetened flour starch had been added produced scouring, and even catarrh, after being fed for some time to the calf. In the case of the young pigs, on the contrary, this milk had a favourable effect in that it perceptibly increased the appetite of the animals. Homogenized milk was taken readily by the pigs, though sometimes it caused scour. This trouble was however, easily overcome by the addition of a small amount of citric acid solution. The young pigs digested the corrected skimmed milk very well, as well indeed as the sweetened starch. They consumed daily (when from 4 to 14 weeks old) with the milk, which they were fed *ad lib.*, per 1000 lbs. live weight, 30 to 47 lbs. of dry matter, 7 to 12.5 lbs. of digestible protein, 0.7 to 12.4 lbs. of digestible fat, 1.6 to 2.2 lbs. of digestible ash, which is equivalent to 34 to 44 lbs. of starch value, or 73 000 to 90 000 digestible calories.

The average daily increase was 2.2 to 3.1 lbs. per 100 lbs. live weight.

The increase in live weight decreased progressively as the animals grew older. An increase in live weight of 1 lb. necessitated a ration of 1.2 to 1.8 lbs. of dry matter in the milk, 0.26 to 0.49 lb. of digestible protein, that is 1.1 to 1.9 lb. of starch value, or 2 300 to 4 100 digestible calories, which are equivalent to 7.3 to 10.8 lbs. of milk.

Of the different kinds of milk, skimmed milk corrected with sweetened flour starch was the least expensive form of food.

For a certain increase in weight, the youngest pigs required less food than older animals. The young pigs, during the experiment, assimilated from 36 to 74 per cent. of the digestible protein. The age of the pigs, together with the nutritive property of each kind of milk, influenced in a marked degree the digestion of protein. The younger the pigs, and the more nutritive the milk, the greater was the proportion of protein digested. The subjects of the experiment decomposed 2.6 to 6.1 lbs. of protein per 1000 lbs. live weight.

The physiological utilization of the different kinds of milk varied from 84 to 90 per cent. The young pigs used from 2250 to 3150 calories to gain 1 lb. in weight.

Rearing animals on skimmed milk corrected with flour and sweetened starch, and on homogenized milk, were the least expensive methods, and cost from half to two-thirds as much as the employment of whole milk.

Analysis has shown that the flesh of younger animals contains less nitrogen and dry matter free from fat, than that of older individuals. The analyses of the young pigs furnished data respecting the repartition of different substances and of chemical energy between the different organs. They further showed that Mangalicza pigs produce more fat, while Berkshires produce more lean meat; this difference manifests itself very clearly from quite an early age.

827 – **The Nutritive Value of Maize Cob Meal.** — TANGL and WEISER in *Die landwirtschaftlichen Versuchsstationen*, Vol. 81, Part 1-2, pp. 35-47. Berlin, 1913.

An account of digestibility experiments made by the writers with sheep; the ration was a mixture of crushed maize corn (75 per cent.) and crushed maize cobs (25 per cent.). The investigations showed that coarsely and finely ground mixtures of crushed maize corn and cobs were equally digestible, but not as digestible as maize corn.

BREEDING

828 – **Why Inbreeding Decreases Fertility.** — WENTWORTH, E. N. in *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1154. Chicago, May 14, 1913.

From the days of the earliest practice of inbreeding there seems to have been a definite idea that it caused degeneration of the stock, evidence of which was supposed to be shown in decreased size, vigour, longevity and fertility.

An experiment on this subject was started through an accident by which mice destroyed the cultures of fruit flies that the writer used for hereditary demonstration purposes in his laboratory work. From the wreckage three pupae were saved that gave a living pair of flies to start with. On mating, they produced 126 offspring.

In a previous article, the writer has spoken of the importance of the law of segregation on the tendency of characters present in preceding generations to separate out in certain individuals.

The offspring of the flies were divided into four strains, one high in fecundity, one low, and two medium. The interesting thing is that the high and low strains breed true, while the middle strains show in many individuals the segregating out of other types. Several hundred individuals were bred, but the table shows only the average production for each line.

Four pairs of flies from the 126 in the first generation, when inbred, gave the following number of offspring.

	High Line	Low Line	Two Medium Lines
3rd generation	128.7	35.9	78.9
4th »	134.6	30.1	81.2
5th »	132.2	29.7	83.7
6th »	135.6	32.7	68.1
7th »	133.4	28.7	60.1
8th »	140.1	29.4	71.3
9th »	138.0	25.7	69.1
10th »	141.3	24.6	66.3
Average . . .	135.9	29.5	72.1

This shows the absolute distinctness of the three groups. When all the groups are added together and the averages taken, each generation after the fifth shows a decrease, similar to the experience of the practical breeder. The third generation equals 80.6; the fourth 81.8; fifth 109.8; sixth 101.5; seventh 98.1; eighth 78.0; ninth 75.5 and tenth 74.6.

The rapid lowering of the averages in the last five generations would be interpreted by the breeder, who thinks only in terms of averages, as excellent proof of the injurious effect of inbreeding. We, however, see that the inbreeding was not at fault, for in the last generation the segregated high line gave its highest production, *viz.* 141.3 individuals. Only one lesson can be drawn from this, *viz.* that the breeder must study his animals individually. Those men who have succeeded by inbreeding have done so by their capacity for careful selection, while those who have failed simply waited for good characters to appear of their own accord.

Inbreeding does not cause degeneration; it only allows weaknesses to appear; and it also brings out the good points, so that the breeder need only select the most suitable animals for further breeding operations.

The distribution of the groups would indicate a simple pair of factors and a 1 : 2 : 1 ratio, as considered in Mendelian inheritance. This is only apparent, however, and more study is needed to completely elucidate the factors.

829 - **Maternal Inheritance and Mendelism.** — TOYAMA, K. (Zoological Institute, College of Agriculture, Tokyo Imperial University) in *Journal of Genetics*, Vol. 2, No. 4, pp. 351-405. London, February 1913.

The writer describes in this paper the results of experiments made by him during the last five years on the hereditary transmission of certain characteristics of form and colour in silkworms' eggs.

The different variations from the normal form and colour are given in a coloured plate.

The writer deals briefly with the origin of these deviations and gives the results of line breeding certain variants for some generations and of crossing breeds or variants possessing different egg-characteristics.

Numerous genealogical tables are given and the most important results are summarized in two chapters devoted respectively to general considerations and conclusions. A brief bibliographical notice of 13 publications is appended.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

830 - **The Thirty-Seventh Fat Cattle Show in Berlin.** — AUGUSTIN and MEYER in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 19, pp. 217-221. Hanover, May 9, 1913.

The writer draws attention to the importance of fat cattle shows from the point of view of meat production, and then gives some information as to which districts took part in the last show and which breeds took most prizes. Illustrations are given showing many of the exhibits.

831 - **The Show of Stud Animals at Algiers.** — MANTOUT, SUISSE, CAUSSE, VERMEIL and CARDONNE in *Revue Agricole et Viticole de l'Afrique du Nord*, No. 59-60, pp. 390-409. Algiers, April-May 1913.

The writers mention the improvements in Algerian stock-breeding which they observed on the occasion of the last Show. Pictures are given of the different typical stud animals, and suggestions brought forward as to the means of promoting stock-breeding and increasing the number of head.

HORSES, ASSES AND MULES

832 - **Horses Imported into the United States in 1912 for Breeding Purposes.** — Animals imported for Breeding Purposes, 1912, Horses. — *U. S. Department of Agriculture, Bureau of Animal Industry*. Washington, April 1913.

In 1912 a total of 3467 horses was imported under the new regulations into the United States for breeding purposes (Bureau of Animal Industry, Order 186 (1)). In the above-mentioned publication of the U. S. Department of Agriculture are given the sex, breed, name and studbook number, the importer, port of importation and the date of the arrival of each animal.

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(1) See No 816, *B*. May 1912. (*Ed.*).

The following table gives a summary:

Breed	Stallions	Brood Mares	Stallions and Mares (*)
Belgian	609	347	956
Clydesdale	33	57	90
Boulonnais (French Draft)	9	—	9
Hackney	14	12	26
Percheron	1104	859	1963
Shetland Pony	4	27	31
Shire	156	91	247
Standard Breed	1	2	3
Suffolk	10	15	25
English Thoroughbred	4	8	12
Welsh Pony	13	92	105
Total	1957	1510	3467

(*) Some of these horses were imported in 1911 and are reckoned in here because the importation formalities were not concluded until after January 1, 1912.

833 - **The Breeds of Horses in Rumania.** — FITIP in *La Vie agricole et rurale*, Year 2, No. 21, pp. 608-613. Paris, April 26, 1913.

In 1900 there were in Rumania 864 746 horses; of these, 584 194 belonged to the Walachian, 193 062 to the Moldau and 87 490 to the Dobrudja breeds. The districts richest in horses are Jalonitza, Ilfov, Dolj, Constantza. Breeds: Moldau, Mountain, Jalonitza and Dobrudja. The last includes four types, of which two (the true Dobrudja and the Russo-Bessarabian types) are fairly widespread. This article contains a description of these breeds and the text is elucidated by illustrations.

834 - **Horse Breeding in German South-West Africa.** — WINKLER in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 40, pp. 373-374. Berlin, May 17, 1913.

Notes on the development and present condition of horse breeding (pictures of typical stud animals being given), the best breeding districts and the natural conditions of horse keeping, together with an account of the Imperial Government Stud at Nauchas and its influence on breeding throughout the country and upon the supply of remounts. Suggestions with regard to breeding.

835 – The Relation Between Live-Weight and Performance in Cows. — PETERS, I. in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 21, pp. 252-253. Hannover, May 23, 1913.

CATTLE

The writer has made some investigations, based on the data of the Dutch Herdbook Association, as to whether heavy or light cows turn their feed to better account. The data for 1911 are given in the two following tables, in which the animals are grouped according to their weight. The figures in Table I-A refer to herdbook cows, while those in Table I-B refer to cows which are not registered. All the cows were five years old.

TABLE I - *A*.

Weight Group	No. of Cows	Average weight lbs.	Milk yield lbs.	Milk-fat yield %	Milk-fat yield lbs.	Increase in live-weight lbs.	Units of (1) performance	Starch value used lbs.	Performance units per 100 kg. (220 lbs) starch value
Under 1 100 lbs.	67	1 056.0	7 101.6	3.26	231.6	59.4	113,6	3 823.6	6.54
1 100-1 208 »	263	1 161.6	7 403.0	3.22	238.0	77.0	119,9	3 854.4	6.84
1 210-1 318 »	464	1 265.0	7 799.0	3.24	252.3	59.4	123,4	3 949.4	6.89
1 320-1 428 »	304	1 368.4	8 109.2	3.22	261.1	55.0	126,3	3 957.8	7.02
over 1 428 »	128	1 482.8	7 856.2	3.21	252.1	37.4	120,1	3 938.0	6.71
Aver. of all groups	1 226	1 280.4	7 727.2	3.23	250.4	59.4	122,5	3 920.4	6.87
TABLE I - *B*.									
Under 1 100 lbs.	84	1 031.8	6 331.6	3.21	203.1	59.4	101,2	3 592.6	6.20
1 100-1 208 »	216	1 157.2	6 892.6	3.19	220.0	83.6	112,5	3 746.6	6.61
1 210-1 318 »	237	1 258.4	7 453.6	3.17	236.7	77.0	118,8	3 999.6	6.54
1 320-1 428 »	143	1 366.2	7 821.0	3.20	250.1	68.2	123,8	4 142.6	6.57
over 1 428 »	32	1 478.4	7 312.8	3.20	234.3	70.4	117,2	3 832.4	6.73
Aver. of all groups	712	1 234.2	7 218.2	3.19	230.1	74.8	115,8	3 896.2	6.54

(1) By unit of performance the writer understands 2.204 lbs. of milk fat, or 6.612 lbs. of body weight substance. (*Ed.*).

From this summary, it is clear that light cows, on the average, are inferior performers. The larger milk yield of the herdbook cows as compared with the unregistered animals is attributed by Mr. Peters to the better constitution and resistance powers of the former.

836 – Studies in Dairy Production. — WOLL, F. W. in *The University of Wisconsin Agricultural Experiment Station, Research Bulletin*, No. 26, pp. 55-135. Madison, October 1912.

These studies are based on the records secured at the Wisconsin Dairy Cow Competitions in 1909-1911. The writer gives the methods adopted for calculating the value of the food consumed and of the milk produced (distinguishing between the value of the butter and that of the skimmed milk) and analyses the results from different points of view. The cows used for the experiment were Holsteins, Guernseys and Jerseys.

SHEEP

837 – **The Wool Industry in the British Dominions.** — BEAN, C. E. W. in *Journal of the Royal Society of Arts*, Vol. LXI, No. 3143, pp. 327-345. London, February 14, 1913.

A century ago, Spain was the only country which exported wool to England, for the Spaniards had developed a most valuable, white-woolled breed known as the "travelling sheep" — the Merino. The primitive ancestral sheep, the black Montanches, still exists in Spain and from this the famous breed was evolved by selection of white-woolled specimens. The Spanish Merino was and is very hardy, picking up a living amongst the dry uplands during part of the year and then travelling along the cañadas or stock routes, to better feed elsewhere.

In 1802, of the 8 000 000 lbs. of wool which England imported from abroad, over 6 000 000 lbs were obtained from the Spanish Merino sheep. Yet this was the time of the Peninsular War, which must have interfered considerably with this commerce, and moreover Parliament had put a duty on imported wool. In 1803 a deputation of English wool manufacturers who had been sent up to London, were informed of the existence of a breed of Spanish sheep in the colony of New South Wales. The proprietor of the flock was a young officer of the 102nd regiment, stationed at Sydney, but at that time in London with samples of his wool. In spite of the scepticism of many persons in Australia and elsewhere, he succeded in convincing the deputation of the future of sheep-breeding in the Colony.

At the beginning of last century, Spain exported rather over 6 000 000 lbs. a year to England; in 1911 Australia sent 314 517 052 lbs. to England, and New Zealand, which was uncolonized in 1803, sent 189 680 851 lbs., while Spain has long ceased to send any at all.

The duty imposed in 1802 applied to all imported wool, colonial or foreign, but in 1825 the duty was taken off colonial supplies. For 19 years the latter enjoyed preference, which resulted in a large increase in the colonial imports, but with the establishment of free trade the foreign imports became larger. Colonial wools, however, more than kept their lead, and at present control the wool markets of the world.

According to statistics, the whole world contains at the present time about 615 000 000 sheep. Of these nearly 93 000 000 are in Australia, 24 000 000 are in New Zealand and 22 000 000 woolled sheep are in South Africa. Thus these three new British States, which possessed hardly any flocks a hundred years ago, now have nearly 140 000 000 sheep. If to these are added the flocks of Canada, the Falkland Islands and the British Isles, the total for these countries amounts to nearly 180 000 000 head. This excludes the sheep of British India, some of which are woolled, and the unwoolled breeds of S. Africa, yet it amounts to nearly a third of the world's sheep in numbers and very much more than that in value.

The importance of British dominions in the world's wool trade is shown in the following table:

	1910	
British Empire.		
Australia	708 644 403	lbs.
New Zealand	204 368 957	»
British South Africa	139 488 573	»
British India	54 458 894	»
United Kingdom	38 185 983	»
Foreign Countries.		
Algeria	22 124 480	lbs.
Argentina	332 010 555	»
Belgium	241 457 748	»
Chile	27 749 867	»
China	31 091 867	»
France	82 685 948	»
Netherlands	20 836 188	»
Peru	8 375 328	»
Russia	20 826 252	»
Spain	23 935 503	»
Turkey	40 156 583	»
Uruguay	92 782 796	»
Others	100 171 000	»
Total	2 189 350 925	lbs.

The way in which the Merino flocks were established in the British settlements overseas was somewhat romantic. The Spanish Government retained for some time the monopoly of Merino sheep, and the sending of these animals outside of the kingdom was attended with severe penalties. But between 1765 and 1809 on several occasions exceptions were made as a compliment to a neighbouring king or government. In 1765 the Elector of Saxony was presented with a flock, and in 1775 some animals from the Spanish flock of Count Negretti were given to the Austrians. The Saxon flock was established at Lohmen and gradually bred to an exquisite fineness of wool. The Austrians placed theirs at Hostitz and bred for strong barrel-like bodies. Other sheep sent to France were tended at the farm at Rambouillet and bred for large frames and long wool.

Others again sent to Holland were partly reexported to the Cape of Good Hope. In 1787 and 1791 a few Merinos were presented to King George of England and kept on the Royal farm at Kew. Finally, a few head sent to America in 1890 and stationed at Vermont were developed to produce a huge expanse of wrinkled skin so as to increase their fleece.

Captain John Macarthur, the young officer from Sydney, had thirty sheep of a Bengal breed sent from Calcutta. They were skinny, long-legged, razor-backed animals absolutely deprived of wool, but he believed that by crossing them with Merinos he would eventually obtain a flock with valuable fleeces, and with some difficulty bought three rams and five ewes from Colonal Gordon's widow, who was parting with her Dutch Merino flock. Colonel Gordon had belonged to the Dutch East India Company and in his charge the Dutch Government had sent a small flock of Merinos to the Cape.

With the Merinos he had bought and the Bengal sheep, Macarthur laid the foundation of Australia's flocks at Elizabeth Farm. He first improved his sheep by crossing the Bengal ewes with some Irish rams he had obtained, and then crossed the product with the Merinos again and again till he obtained wool of excellent quality and fleeces weighing on an average 5 lbs.

In 1801 he came to England, and in spite of the opposition of Sir Joseph Banks, received a concession of 10 000 acres of land and was allotted some convicts as shepherds. He then bought seven rams and one ewe from King George's Merino flock at Kew, which was, however, not in very good condition. Returning to Australia, Macarthur took up his great task and within eighteen years — in 1822 — he was presented by the Duke of Sussex with two gold medals "for importing into England wool...... equal to the finest Saxony". It should be mentioned that the first Saxon sheep are said to have been exported into Australia only in 1825 or 1826, but soon afterwards great numbers of these animals were imported into Tasmania and some magnificent flocks were established there, while Victoria was colonized from Tasmania. Since then the Rambouillet and Vermont flocks have also had their influence. In order to meet the demand for mutton, some of the Australian owners began to cross their sheep with large English Southdowns, but later fineness of wool became the only object of the sheep-breeder. In 1912, the average weight of the fleece of Australian sheep, including lambs, was 7 ½ lbs., while individual fleeces have run to as much as 40 lbs.

The South African sheep had much the same history, the fat-tailed Cape sheep with the whitest hair being crossed repeatedly with Merino rams. Here, curious cases of atavism occur even now. The modern breed has been founded on Australian stud sheep, some of the rams costing as much as £1000.

Australia's success in the breeding of fine-woolled sheep has been ultimately due to the fact that they can be raised there with practically no attention throughout the year, and with but little other expense than the hire of a few shepherds. In order to protect the sheep from the dingo (a wild dog) and reduce the number of shepherds, the runs are enclosed with a fence of wire netting. Feeding in the sense understood by the English farmer is unknown and the animals graze on the natural pastures except in seasons of exceptional drought. In South Africa, sheep live very much as on the Central Australian runs, except that in the waterless parts they have regularly to be withdrawn during a part of the year. The great difficulty has been the jackal, but the fencing of the farms is minimising the danger. In the Falkland Islands the methods very closely resemble those of Australia, and the sheep-farming industry in Patagonia was originally started by the Falklanders and is still fed by emigration from those islands.

The first stage of British dominions and colonies has generally been a pastoral stage. The land, or most of it, usually belongs to the Government, and concessions are made of grazing rights on the payment of a small annual sum. The large tracts of land over which each man acquires grazing rights are called stations or runs in Australia and New Zealand, and sometimes also in the Falkland Islands, and ranches in Western Canada, In time the Australian squatter, or Canadian sheep or cattle man, builds a very comfortable homestead. With the development of roads and railways and the increase of population, the best land about streams and waterholes is required by the Government for agriculture and is leased to settlers. Though this policy of the Government can scarcely be called in question, it has given rise to more or less open warfare between the pastoralist and the intruding farmer; the quarrel however usually adjusts itself and almost always in favour of the latter. But there remains a sharp distinction between the pastoralists, who occupy great expanses of country for stock, and the farmers proper. Some of the stations are of enormous size; the largest in the Falklands is 700 000 acres and supports nearly 200 000 sheep. The average size of a sheep run there is 12 000 acres with from three to five acres per sheep.

The pastoralist of Australia and New Zealand is a capitalist and usually possesses good education and credit. He studies the literature dealing with his work, and his methods of breeding and shearing are the most perfect in the world and produce excellent wool. Certain stud farms in Victoria and Tasmania, *e. g.* Wanganella, Boonooke and Uardry, have become famous for the quality of their wool.

Shearing is done by machine shears and is effected between May and December by professional shearers, who visit the different stations. The fleeces are classified and sorted before leaving the shearing-shed by experienced and conscientious persons, the wool of a station being sometimes classified into at least fifty descriptions, and the classifier may be paid as much as £10 per week. In this way the highest prices can be obtained for the wool.

Formerly such South African wool as arrived in London was miserably packed and got up and realized lower prices than Australian wool. Shearing was (and still is) done by hand twice a year, and the trade was in the hands of small dealers. But of late years great progress has been made in classing and packing the wool, as well as in the trading methods. The industry has also developed satisfactorily in the Falklands.

The wool sales in Australasia are remarkably well organised, being quite independent of the intervention of middlemen. Formely the chief sales were held in London at the Wool Exchange in Coleman Street; but nowadays the greater part take place in Australia and New Zealand, while the big London market deals with supplies from the Cape, the Falkland Islands and other parts.

Owing to the transport, the average prices on the London market are higher than those on the Australian markets, which are patronised by the Germans (who buy heavily at Sydney), the French, the Belgians, the Dutch etc. The Australian squatter has from the first been able to sell his wool on his own account in London on account of the great facilities for local credit which he has always possessed.

In the last century, the great sheep runs and stations of the British Empire overseas were the most important sources of the wool supply, but it is very doubtful if they will continue to be so in the future, for two great changes are affecting firstly the class of wool from oversea and secondly the class of grower by whom that wool is produced. The Governments are cutting up large areas of stations and establishing farms in their place. It is from these farms that the wool of the future must come, and therefore the basis upon which the sheep-rearing industry has been established will be different.

After the discovery of the possibility of transporting frozen meat by sea, which revolutionized the food supply of England and greatly increased the wealth of Australasia, the colonists began to cross Merino ewes with rams of the long-woolled early-maturing breeds: Romney Marsh in New Zealand; Leicester, Border Leicester and Romney Marsh in Australia; Lincoln and Romney Marsh in the Argentine. In order to obtain better mutton and a quick-maturing lamb, crosses, or especially second crosses, were made with short-woolled English sheep: Shropshires, etc.

Thus the class of oversea wool is changing; already more than a quarter of the wool from Australasia is cross-bred, and the proportion is continually increasing. Crossing has been practised most in New Zealand and Argentina, and least in Australia and South Africa. Cross-breeding in Australia and New Zealand consists at present in keeping pure-bred Merino ewes and pure British rams, and breeding one or two crosses from them. As an exception to this rule must be mentioned the fact that in New Zealand Merino ewes have been crossed with Lincoln rams and the half-bred offspring in-bred, until the so-called Corriedale sheep has been produced.

The replacing of the big stations by closer settlements has reduced the standard of breeding; the farmer cannot afford to pay exorbitant prices for his rams as can the pastoralist (1), neither can he concentrate all his attention on his flock. Nevertheless the local Governments, especially in South Africa, are making great efforts to educate the farmers up to the excellent methods now employed on the big stations, while the system of cooperation, which is gaining ground in Queensland, may also help to maintain and render more secure the returns of the sheep industry.

Lastly, while the pastoral age of sheep-farming is probably destined to pass away altogether in New Zealand and Canada, it will never disappear from vast tracts of Australia and South Africa where the dry climate and poor soil make the general conditions unsuitable for agriculture.

It appears probable that a large supply of fine Merino wool will always come from the large holdings of Australia and South Africa, though increasing quantities will be produced by the cross-breds on the farms. The demand for wool is increasing in Europe, and is expected to increase shortly in America. It is growing fast in Japan, and the demand from China, if it comes into existence, is a factor hardly to be realized. The killing of sheep for freezing tends more and more to keep the numbers down and, except within the British Empire, the world's flocks seem to be decreasing. Everything points to a prosperous future for the wool industry, to the special advantage of the British Dominions in which it holds such an important place.

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(1) £1600 was paid for the ram "President", in 1896, £1500 for "Admiral" in 1899, and £1500 for "Dandie Dinmont" in 1904. (*Ed.*).

PIGS

838 - Experiments with Pigs. — CLARK, R. W. *Montana Agricultural College Experiment Station, Bulletin No. 89*, pp. 16. Bozeman, Montana, June 1913.

At the end of this Bulletin, the writer gives the results of eight pig-feeding experiments with different proportions of various feeds: shorts, barley, frosted wheat, lucerne, sugar beets, blood meal, skimmed milk, etc. Other experiments were made in order to determine the most suitable rations for brood sows. Mr. Clark also deals with the returns from feeding five brood sows and their litters for one year.

POULTRY

839 - Further Report on Egg-laying Competitions in the Rhineland. — BOSCH, R. in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 14, No. 18, pp. 310-314, No. 19, pp. 327-330. Bonn, May 2 and 9, 1913.

The Chamber of Agriculture for the Rhineland has during the last three years conducted egg-laying competitions for poultry lasting ten months in each year, from November to August, at its special grounds. The results of the first two years work are given in the present report. The first year 210 one-year-old hens were tested and in the second year 210 two-year-old hens; with few exceptions in both competitions the same birds were used. Each of the six breeds examined were represented by seven families, each consisting of five members.

The comparison between the total yield of the one-year-old birds and that of the two-year-olds is considerably in favour of the former. During the ten months that the competition lasted the one-year-old hens laid 125 eggs (worth 11s 3¼ *d*), the two-year-olds 102.4 eggs (worth 8s 7¾ *d*). The eggs laid in winter by the latter were only 34.71 per cent. of those laid by the former.

The following are the scores of the various breeds;

Breed	Average number of eggs laid	
	One-year-old hens	Two-year-old hens
Black Rhenish	104.7	124.1
White Wyandotte	130.7	99.3
Black Minorca	126.5	99.6
Partridge Italian	121.0	103.7
Buff Orpington	119.8	92.1
White Orpington	111.3	95.5

The small breeds have thus proved more productive than the medium-sized; nevertheless the difference was not so marked among the one-year-olds as among the others. As for their behaviour during the various periods of the competitions the small and medium breeds gave one third of the total yield during the first five months. The maximum number of eggs laid by the small breeds was in May for the one-year-olds and in April for the two-year-olds, while that of the medium-sized breeds was in both cases one month earlier.

The writer then compares the yields of the best and the worsr families and finds that in both competitions the Rhenish and the Italian breeds show the most uniform results. The Minorca families showed also in the first competition considerable uniformity, but less in the second. Among the medium-sized breeds the yields of the various families were very different and this the writer attributes to the still incomplete improvement of the breeds.

Lastly, concerning the weight of the eggs, the heaviest were those of the Minorcas (2.20 oz.) and of the White Orpingtons (2.11 oz.); the lightest were the Italians (2.03 oz.) and the Rhenish (1.98 oz). The best layers accordingly produce the lightest eggs. The eggs laid by the one-year-olds were on the average 0.08 oz. lighter than those of the two-year-olds.

The writer reports upon the money value of the eggs and gives some advice on the keeping of egg-laying poultry.

840 - **Irish Egg-Laying Competition, 1st October to 31st December 1912.** — MURPHY, E. in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 303-306. Dublin, January 1913.

During 1912 it was felt that a fresh stimulus to the industry of rearing farm poultry in Ireland was necessary; to this end the Department of Agriculture and Technical Instruction arranged that the first Irish Egg-Laying Competition should be held at the Munster Institute, Cork.

The site selected was a level strip of land, which had never been used for poultry. The soil is very suitable, being a rich loam over limestone gravel, but there is no natural shelter.

The runs are 54 in number, 52 being occupied by competition birds. Every pen of six pullets is provided with a separate house and run. The latter is sheeted with boards on all sides to a height of 3ft. The houses are well sheltered from the weather and are each provided with three trap nests. All doors open on the passage, as do the trap nests, so that untrapping, feeding, cleaning, etc., can be done without entering the runs.

The pullets arrived at the place of competition on September 13, 1912, and the contest began on October 1.

The following were the breeds entered:

Breed	No. of pens entered
White Wyandotte	12
Barred Rock	8
Rhode Island Red	6
Buff Orpington	5
White Leghorn	5
Brown Leghorn	4
White Orpington	4
Red Sussex	3
Faverolle	3
Light Sussex	1
Minorca	1
Control pen (Rhode Island Red)	1

The 54th pen is used for broody hens.

Taking into account that this was the first competition held in Ireland, and that most of the competitors were novices at selecting birds for such a contest, the quality was very fair, and though too early hatching, immaturity and bad condition were apparent in some of the exhibits, only two birds died, and the health of the birds remained good in spite of the bad weather in December. The leading pens were all in splendid condition on arrival.

The foods used were oats, maize, wheat, pollards, thirds, bran, linseed meal, meat meal, cut clover, hay, cabbage and milk. A supply of grit and shell is always available and the birds have water both inside and outside the house.

The writer gives a table showing the position of the different breeds, as regards the number of eggs laid, as well as the price obtained for the latter.

The number of eggs laid by the 10 best pens was as follows :

1. Red Sussex	296
2. White Wyandotte	293
3. Buff Orpington	244
4. Rhode Island Red	231
5. White Wyandotte	203
6. Buff Orpington	199
7. Rhode Island Red	195
8. Brown Leghorn	191
9. Rhode Island Red	189
10. Rhode Island Red	188

841 - **A Danish Eel Farm.** — GREEN, CHARLES in *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XIII, No. 2, pp. 300-302, Dublin, January 1913.

FISH

On the north coast of Zealand in Denmark, just within the entrance of the Ise Fjord, there has been established since 1905 an eel fishery, which, for ingenuity and simplicity, is probably unique.

A dike had been constructed at Hov-Vig near the village of Ny-Kjöbing with the intention of reclaiming a portion of land for agricultural purposes. That undertaking having been found unremunerative and abandoned, Mr. Nielsen, of Copenhagen, conceived the idea of turning it into an eel-farm.

Within the embankment there are about 300 acres under water; the water is fresh and, in a great part, only two feet deep; it is supplied by the surface drainage of the surrounding land.

When taken over by Mr. Nielsen, the lake already held a small stock of eels, which had doubtless found their way in through a sluice-gate situated at about the centre of the embankment; this stock has been systematically increased by the introduction of elvers, captured as follows:

On the appearance of the eel fry in the fjord at the end of their long journey from the breeding grounds in the Atlantic Ocean, a rough crate heaped full of water-weeds is lowered into position across the front of the sluice gate. The latter is then raised so as to allow a stream of fresh water to flow through the crate. The elvers, in search of fresh water, make their way upstream to the crate and remain entangled among the weeds, which in due course are lifted out and shaken over a piece of very fine-meshed net. This enables the proprietor to estimate the number of elvers introduced annually into the lake; the estimate is based on the weight of the elvers, of which about 1 500 go to the pound.

The capture of the mature silver eels for the market is effected by means of an apparatus designed and constructed by Mr. Nielsen. It can be worked by him single-handed, assistance only being required occasionally for heavy work. Slung from a frame-work of rough poles is a box, or chest, about twelve feet long; round the sides of it are openings about nine inches square, each provided with a small conical eel net of the ordinary shape opening internally into the box, and a row of holes which permit the circulation of the water and the escape of undersized eels. The central part of the box is carried up so as to be above water when the main part is submerged, and a hatch in the side of this vertical prolongation gives access to the interior.

On the bank is a windmill by means of which salt water from the fjord can be pumped into a channel leading at either end to a wooden shoot.

The day before a consignment of eels is to be taken, the windmill is set in operation, and a continuous stream of salt water is discharged in front of either box, in order to collect the mature eels by taking advantage of the migratory impulse involved in their condition which leads them seawards. The box is lowered into the water at nightfall by means of the geared winch at each end of the frame, and the stream of salt water is led in to the top of it by an extension of the wooden shoot. The eels are thus enticed into the box, which is subsequently hoisted for their removal. At the time of the writers' visit to Hov-Vig there were two of these boxes in use.

To control the increase of salinity in the water of the lake, due to the salt water pumped in and to evaporation, a second windmill is installed, by which fresh water can be pumped in when required from a neighbouring land-drainage canal.

The lake contains a large number of *Mysis* and apparently enough natural food to support a certain stock of eels. Mr. Nielsen, however, supplies a considerable quantity of artificial food consisting of unmarketable fish (which is minced in a machine driven by a rope-belt from the first-mentioned windmill and thrown loose into the lake); this proceeding he regards as still of an experimental character, though he believes it has a stimulating effect on the growth of the eels.

The subjoined figures show that the success of the enterprise is fairly evident. The elvers turned down in 1905 would normally begin to reach maturity in five or six years, and that a large number of them have done so is clear from the sudden increase in the yield of marketable eels in 1910 and 1911.

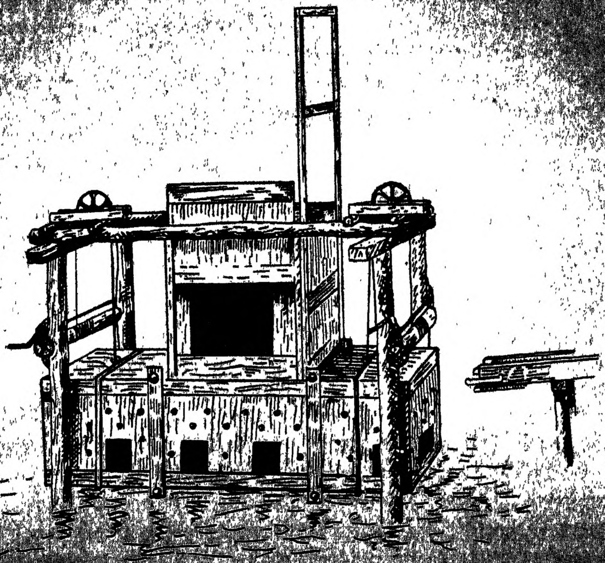


Fig. 1

Eel-catching box raised out of the water.

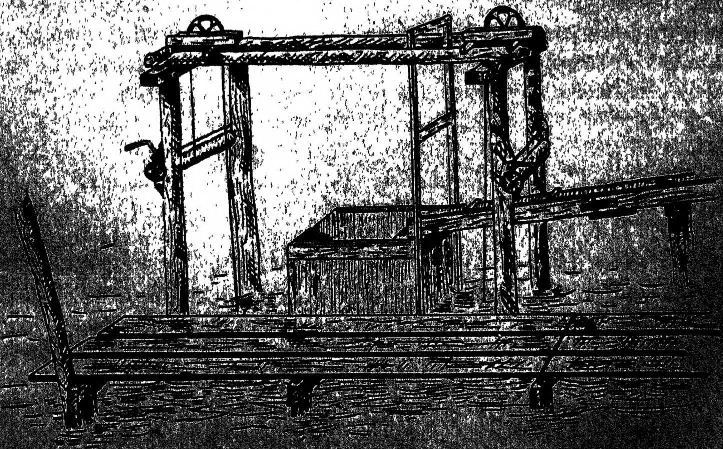


Fig. 2

Salt water being pumped into eel-catching box.

Year	Number of elvers turned down in lake	Catch of marketable eels in cwt.
—	—	—
1905	49 000	—
1906	60 000	27 3/4
1907	128 000	45 1/4
1908	100 000	40 1/4
1909	100 000	[illegible]2
1910	60 000	78 1/2
1911	70 000	136 3/4
1912	159 000	—

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

842 - **Trials of Motor Tractors in Algiers.** — VENTON-DUCLAUX in *La Vie Agricole et Rurale*, Year 2, No. 23, pp. 660-667. Paris, May 10, 1913.

The ploughing competition, held in connection with the Show of Motors and Agricultural Machines organized by the French and Algerian Automobile Clubs at Algiers (March 22 to April 20), lasted two days. It took place in the presence of the President of the French Automobile Club and of the Governor-General, on ground about 17 miles from Algiers.

Seven firms took part in the competition: Mac Laren, Case, Avery, Lefebvre, Arion, the Stock Motor-Plough Co. Ltd., and the Franco-Hungarian Society. Seven machines in all were tested.

The writer gives in his paper a description and figures of the different tractors, and of the conditions of the trials. No classification was made of the performances.

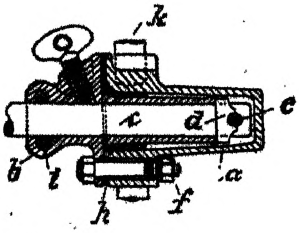
The judging committee expressed the wish that the constructors should turn their attention to devising machines for the Algerian market, taking into consideration the special conditions and requirements obtaining in Algeria.

843 - **Eckert's Plough Wheel Nave.** — MARTINY in *Landwirtschaftliche Umschau*, Year 5, No. 20, pp. 459-460. Magdeburg, May 16, 1913.

The construction of the wheel naves of agricultural field machines is of the greatest importance for the lightness of draught and durability of the machine.

Formerly in the closed naves a ring was forged on the wheel axle to prevent the wheel from slipping off, but when it began to be much worn it could not be replaced by another one. The nave and the set of spokes were two separate pieces and the disks that joined them were also separate pieces, so that in taking to pieces or fitting up such a wheel a number of small parts had to be dealt with.

In the most recent model of closed naves (see fig.) this difficulty is avoided. To prevent the wheel slipping off, a loose ring (*d*) is put on the axle and kept in its place by a pin (*e*). This ring abuts immediately against the disk (*b*) which acts also as box to the wheel. The packing which fills up the space between the axle and the disk is situated in the hollow (*i*) of the disk (*b*). Between the nave (*a*) and the disk (*b*) a cardboard disk (*h*) is placed; this acts also as an elastic body to prevent fractures. The result is simplicity in construction and in fitting.



To take it to pieces only the two bolts (*f*) have to be loosened and the set of spokes (*k*) with the nave (*a*) attached to it can be slipped off the axle. On removing the pin (*e*), the ring (*d*) and the disk (*b*) can be removed. These are no other parts. All the working parts are interchangeable, and they are proof against the entrance of dust.

The leakage of lubricants is also impossible. Smooth running with only a small amount of lubrication is obtained by the milling of the axle and perfect construction of the working parts.

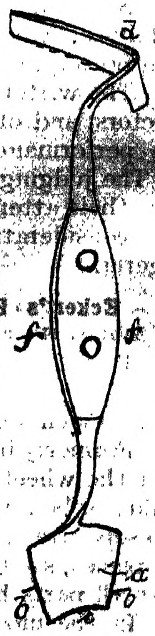
The above-mentioned details afford an example of the degree to which certain parts of machines may be improved.

844 – **Patent Implement for Singling Beets** (German Patent 248355). — *Deutsche LandwirtschaftlichePresse*, Year 40, No. 23, p. 279. Berlin, March 19, 1913.

This implement made in one piece combines two utensils required for the singling and hoeing of beets. As the annexed figure shows, one end of the tool is formed by a curved blade with cutting edges on both sides (b) and in front (a). At the other end there is a narrow knife bent obliquely at an obtuse angle. Between the two ends a wooden handle is situated.

By means of this implement the beets may be singled, weeds removed and the earth loosened. The curved blade (a) is driven into the ground in the immediate vicinity of the plant that is to be left, and the edges (b) are pressed and turned right and left in the ground about it, thus destroying the unnecessary beets and weeds. The cutting edge (c) is used against weeds reaching low down. The blade (a) is bent in such a way that the edges (b) are situated almost parallel to the handle, but in such a way that the operator's hand does not come into contact with the soil.

The bent knife (d) at the other end of the implement is used as is well known, for singling other beets, hoeing and loosening the earth at a greater distance from the beet which is left.



Crushing Mill "Unica No. 2" with "Unica" Sifter.

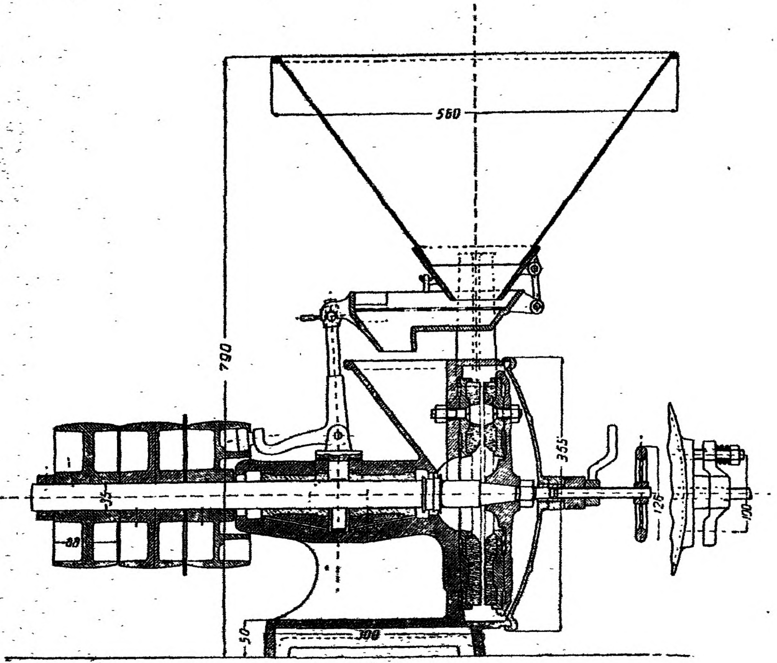

560
790
355
126
100
300
50
80

Fig. 1. — Longitudinal section of mill.

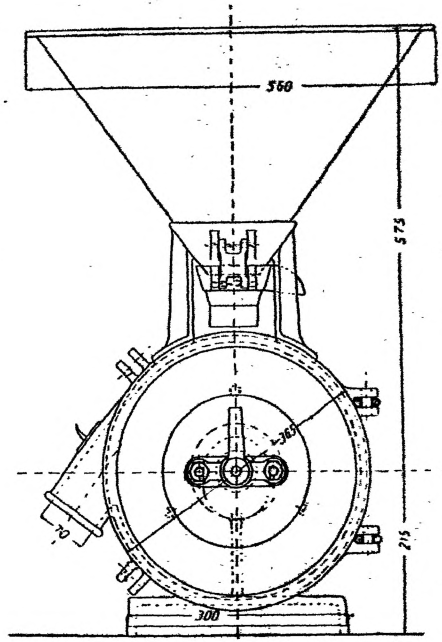

560
575
215
365
70
300

Fig. 2. — Front elevation of mill.

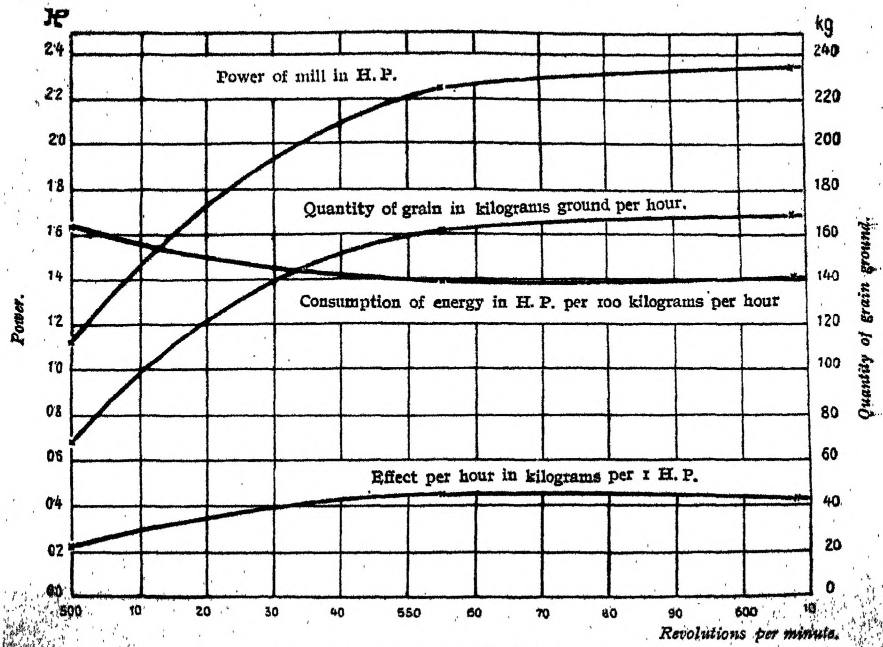


Fig. 3. — Diagram of the work done and of the work absorbed by the mill according to the number of revolutions.

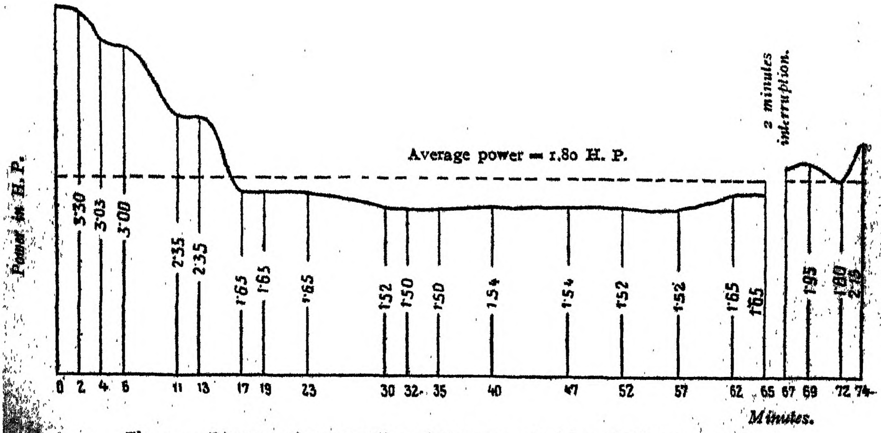


Fig. 4. — Diagram of consumption of energy required for grinding 55 lbs. of rye.

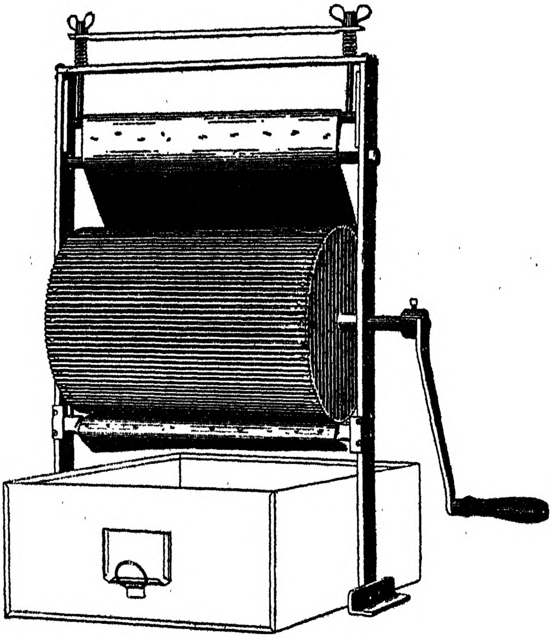
845 – **The Roller and Packer.** — BONEBRIGHT, H. B. in *Montana Agricultural College Experiment Station, Circular* 21, pp. 26-32. Bozeman, Februaary 1913.

The writer describes the construction of cement corrugated rollers which are of two types: those made with wheels of cement with bare faces, and those with cement wheels having steel faces.

Among the illustrations accompanying this circular is one of a corrugated roller of which only the discs, which are placed loose on the axis, are of cement, the rims being of steel, while another figure shows a roller made entirely of cement.

846 – **A Hand Grain Thrasher.** — BRIGGS, L. J. in *U. S. Department of Agriculture. Bureau of Plant Industry, Circular No.* 119, pp. 23-24. Washington, March 29, 1913.

The simple hand thrasher shown in the accompanying illustration has proved very useful in thrashing small quantities of grain from experiment plots. It consists of a rotating rubber-covered cylinder 8 inches in diameter and 12 inches long, and a stationary apron, the tension of which, and its distance from the cylinder, may be adjusted at will.



The frame of the machine is of steel, and the cylinder is built up from disks of wood 2 inches thick glued together. The cylinder is covered with rubber matting, the corrugations of which are parallel to the axis. The matting is secured by tacks and staples and can easily be removed when worn. The apron is of rough canvas or similar material.

Essential features of the machine are the care with which the position of the apron and its distance from the cylinder can be adjusted. The whole machine can also easily be cleaned.

847 – **American Cereal Esiccator.** — HOFFMANN, I. F. in *Zeitschrift des Vereins Deutscher Ingenieure*, Vol. 57, No. 21, pp. 809-817. Berlin, May 24, 1913.

The writer treats first of all of the difficulties which attend the esiccation of cereals. He then describes six esiccators of various types: 1. The Chicago Ellis Drier Company's cereal drier. 2. Hess' esiccator. 3. The

Eureka drier, built by S. Howes of Silver Creek, N. Y. 4. Mc Daniels' drier. 5. Morris' drier and the paddle wheel drier of E. F. Mead of New York. The great quantity of air used in the American driers is remarkable, no less than 400 to 480 cubic feet per 100 lbs. of grain, representing a great waste of heat and of power. Though the American types of driers deserve to be studied, they cannot be considered as the last word in the question of cereal esiccators.

848 - **Ventilator for Chaff-Cutting Machine, built by Wilhelm Graf, Machine Works, Karlsruhe i. B.** (German Patent 187611). — HOLLDACK in *Mitteilungen des Verbandes landwirtschaftlicher Maschinen-Prüfungs-Anstalten*, Year 7, Part 1, pp. 5-11. Berlin, 1913.

This ventilator for chaff-cutters is built in several sizes. Size No. 3, weighing 440 lbs. and costing about £ 25 in 1911-12, was submitted to a careful test at the Royal Württemberg Machine Experiment Station at Hohenheim. It appears very advisable in large farms, especially where valuable horses are kept, to ventilate hay and straw at the same time that they go through the chaff-cutting machine. The fragments of clover leaves and similar forage that get removed with the dust form a negligible quantity compared with the mass of forage treated, and when this is of good quality they may be kept and fed to pigs.

The machine is solidly built and has proved durable. It requires a motor of about 1¼ H.P. to drive it.

849 - **Trial of a Meal and Groat Mill, "Unica No. 2", and Attached Sifter of A. Fiebinger's I. Styrian Milling Machinery Works in Graz.** — REZEK, J. in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. I, Part 4, pp. 585-589. Vienna, May 8, 1913.

A simple solid wooden framework bears the meal and groat mill and contains the sifter in its central part. The lower extremity of the framework is fashioned like a box and holds two drawers for the reception of the ground product. The individual details of construction of the mill are shown in the section, fig. 1, and elevation, fig. 2, and do not require special description.

The total weight of the machine is 482 lbs.

The machine was tested on July 10, 1912. A continuous current electric motor with switch regulator was used as driving power, and the work done was measured with precision by electric instruments.

At first barley was ground to fine grit for 13 minutes. Then oats were ground for 10 minutes, and after these coarse ground yellow maize was experimented upon three times in succession.

More complete tests were made with rye. The observations and results of these experiments are shown in the graph, fig. 3, which shows also that the most favourable number of revolutions for this mill is about 560 to 570.

Determinations were made of the amount of force required by the mill and sifter, including the losses due to the belting. From the values shown graphically in fig. 4, it is seen that the average power required is 1.80 H. P.; the total amount for the grinding of 55 lbs. of rye is 2.2 H.P. hour; the maximum, as shown by fig. 4, was 3.3 H. P.

From the above it appears that the mill performs a relatively large amount of work with a small consumption of power, and that it would be economically advantageous to those farmers who, besides preparing coarse meal for their live stock, wish to grind their grain for baking purposes.

850 – **Testing the Hourly Performance of the Hand Centrifugal Milk Separator ("Balance No. 61" for 225 litres) of Holler's Carlshütte Factory in Rendsburg.** — REZEK, J. in *Österreichische Molkerei-Zeitung*, Year 20, No. 8, pp. 115-118. Vienna, April 15, 1913.

On November 28 and 29, 1912, this centrifugal separator weighing 36 kg. (79.3 lbs.) when in working order and costing £ 12, was tested at the Testing Station for agricultural machines and implements in Vienna, which belongs to the "K. K. Hochschule für Bodenkultur".

The writer first gives a detailed description of the machine and then an account of the tests and their results. The relation between the force expended and the work performed by the centrifugal apparatus was estimated, both by an electric process of measurement, and by Leuner's spring-dynamometer.

A total of 17 cream separation operations were carried out, the results of which are tabulated. According to these data, in ordinary dairy procedure only 0.12 per cent. of fat, on an average, is left in the skimmed milk; this may be considered a very creditable performance. With a decrease of about 20 per cent. in the number of revolutions, the average increase in the fat content of skimmed milk was 0.22 per cent. and when the temperature of the milk fell to 20° C., the percentage of fat still remained at 0.21.

The machine makes very little noise when in motion. Its construction is simple; all the different portions are easy of access and are very well made. No particular skill is required in taking the apparatus to pieces, or in cleaning it and putting it together again, and the whole operation only occupies a few minutes. The cleaning of the discs is much facilitated by the presence of a wire rod upon which they are threaded.

Taking the results as a whole, a very favourable judgment was passed on the apparatus in question.

851 – **Temperature Regulator.** — SCHOLZ, M. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part 10, pp. 301-305. Hannover, May 15, 1913.

It is not an easy task for the employeés of a dairy to keep a constant and uniform temperature in the apparatus for warming milk. The writer has invented a regulating device which has the object of rendering the warming of milk and keeping it uniformly at the required temperature much easier.

This new regulator is distinguished by the facility with which its component parts may be changed; it is constructed on the principle that the expansion or contraction of a body called the «feeler», which is placed in the milk outflow, closes or opens the cock which admits steam to the heater. The admisson of steam is thus regulated directly by the temperature of the milk outflow. The writer gives, in his paper, a short description and illustration of the three types of this new regulator.

852 - Review of Patents.

Machines for Tilling the Soil

259 892 (Addition to Patent 228 891) (Germany). Gang ploughs for working the soil to various depths.
59 632 (Austria). Motor plough.
59 633 (Austria). Cultivator.
1 061 354 (United States). Spring-tooth cultivator.
1 061 291 (United States). Automatic adjusting plough.
2 150 (England). Motor plough.
130 182 (Italy). New system of mechanical ploughing with electric, steam or gas power.
59 816 (Switzerland). Motor plough.
59 817 (Switzerland). Cultivator.
258 861 (Germany). Farmyard manure spreader in which the manure is comminuted by a special cutter before being spread.
59 813 (Austria). Manure spreader.

Sowing machines.

259 261 (Germany). Multiple furrow potato drill with chain of cups under the hopper.
59 572 (Austria). Sowing machine.
59 573 (Austria). Steering gear for machines cultivating rows.
1 061 517 (United States). Mechanism for grain-drill.

Mowing machines.

259 532 (Germany). Reaper and binder with movable motor to be placed on the frame.
6 578 (England). Agricultural mowing machines.
8 763 (England). Attachments for mowing machines.

Threshing machines.

1 060 890 (United States). Threshing machines.
7 971 (England). Threshing machine.

Other agricultural machines and implements.

59 815 (Austria). Machine for beating out scythes.
59 808 (Austria). Agricultural watering machine.
1 060 828 (United States). Milking machine.
129 433 (Italy). Grain drier.
130 358 (Italy). Drier for rice, maize, etc.
59 818 (Switzerland). Automatic hay lifter for carts.

BUILDING-
NSTRUCTION

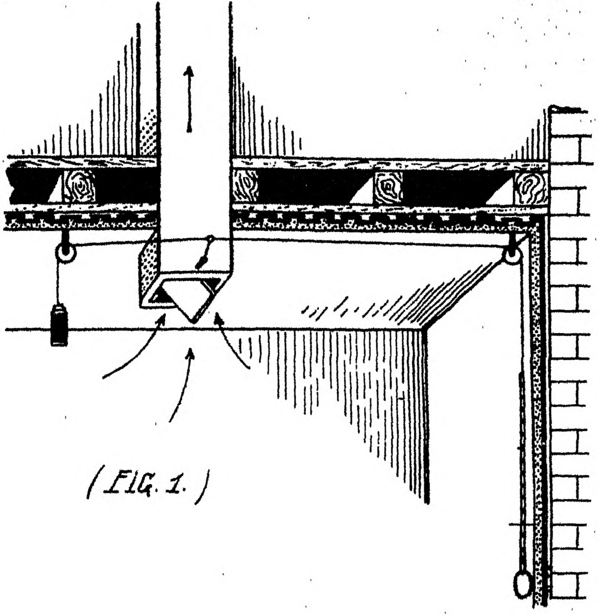
853 - Systematic Ventilation of Stables.

— *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 16, pp. 191-192. Hannover, April 18, 1913.

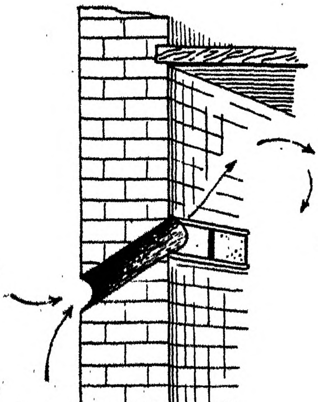
In the proper ventilation of a stable, the vitiated air must escape and be replaced by pure air without draughts being formed or the temperature being lowered.

The escape of the foul air is easily obtained by means of one or more vertical flues in the roof of the stable. The upper end of the flue must be sufficiently high that the motion of the air in it should not be affected by the outer currents of air, and its lower aperture projecting 6 or 8 inches into the stable must not be situated immediately over the animals. The escape flue may be in the middle of the stable or at the end opposite to the aperture by which pure air is introduced (See fig. 1).

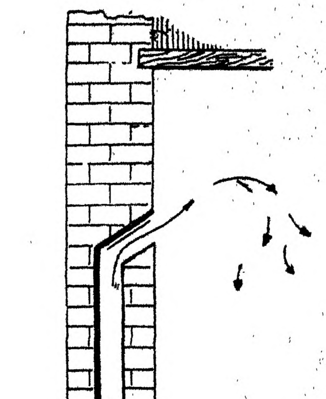
Four-sided shafts made of boards planed smooth on the inside are very suitable. They are easily made and are cheap and they have besides the



(FIG. 1.)



(FIG. 2.)



(FIG. 3.)

advantage that, wood being a bad conductor of heat, they do not easily cool, which would retard ventilation. If the stable is not immediately under the roof but under other rooms or a hay loft, the shaft must have a fire-proof casing on the outside; in order to draw well it should also be provided with a suction-cowl at the top. The section must be 8 × 8 inches for three head of large stock, 10 × 10 in. for six and 12 × 12 in. for nine head. For more than nine head it is advisable, to use several shafts. As it is sometimes necessary, especially during stormy weather, to close wholly or partially the opening in the roof, the shaft is provided with a shutter.

2. As for the introduction of pure air, this is still simpler. According to practical experience the aperture which admits the outside air is most advantageously situated at about two thirds the height of the stable. As fig. 2 shows, a simple hole in the wall, obliquely ascending from the outside to the inside, is sufficient. The cold exterior air flows into the upper part of the stable where it gains some warmth and then spreads throughout the stable. If the intake be placed too high the draught in the ventilator is diminished or even ceases. These openings must also be provided with sliding shutters to admit of their being closed when necessary. Their cross-section should be 5 × 10 inches for every three head of large stock. In new buildings glazed earthen pipes can be conveniently built into the walls as in fig. 3, the inlet being situated about 20 inches above the ground.

RURAL ECONOMICS.

RURAL ECONOMICS

854 - **Calculation of the Cost of Production in Peasant Farms, with Special Reference to Milk.** — PAULI, W. in *Archiv für exakte Wirtschaftsforschung*. Supplement, Part 7, pp. XI + 333. Jena, 1913.

In the introduction, the writer lays stress on the importance of the calculation of the cost of production, from the scientific and social points of view, as well as from that of private economy. He then reviews its theoretical and practical evolution from its origin, at the beginning of the seventeenth century, up to the present time in which it has attained considerable development.

The methods pursued now in the calculation of the cost of production of agricultural staples may be divided into two groups: 1) those in which the costs of production are deduced from the results of the single branches (accounts), or "account" or "analytical" methods; 2) those in which the costs of production are derived from the total results of the farms, or the "totality" or "synthetic" method ("Einheitsverfahren") of Laur.

The analytical method may be applied: 1) with book-keeping by double entry (systematic calculation); 2) with book-keeping by single entry in which account is kept of the amount of labour required, the exchange of products and the special occasional accounts connected with them (occasional calculation); 3) with estimated, more or less arbitrarily chosen, averages (speculative calculation); 4) with the industrial method of special calculations. The question as to which kind of calculation is to be chosen can only be answered for each single case according to the extent of the farm, the degree of culture of the farmer and the kind of production.

The results of the analytical methods of calculation in agriculture are in a great measure dependent upon: 1) the choice of the unitary price adopted for the calculation of the produce; 2) the distribution of the cost of labour, 3) the distribution of the cost of manuring among the various crops of a rotation.

In the selection of the unitary prices to be employed in the calculation, the following are to be distinguished :

1. Values of cost of production.	Absolute cost.	Purchase and production values
2. Purchase price delivered at the farm.		
3. Relative purchase price (calculated on the purchase prices of equivalent wares, capable of replacing them, delivered at the farm).	Relative or deduced cost.	
4. Relative cost of production (calculated on the cost of production of equivalent wares)		
5. Sale prices at the farm	Realization values.	
6. Relative sale prices at the farm (calculated on the sale prices of similar products)		
7. Transformation value (value of produce that has been worked up, minus the cost of transformation).		
8. Relative transformation values (for by-products calculated on the transformation value of the principal product)		

Before selecting the values which are to serve as prices in drawing up the various accounts, some economic considerations are to be made according to the following principles : In the account the values here given are to be taken:

1. The cost of production, when the other purchase prices are higher and the realization values, especially the sale prices, are lower than the cost of production.

2. The purchase prices for goods delivered at the farm, when these are inferior to the costs of production.

3. The sale prices, at the farm, when these are higher than the costs of production.

When the costs of production of a commodity are to be determined for a whole country (costs of production applied to political economy) the prices of foreign markets are to be used for determining the market prices. As a rule, though, the costs of transport and brokerage make such a difference between purchase and sale prices of goods delivered at the farm, that the cost of production will stand between the two, whence as a rule only the cost of production will have to be considered. Only those commodities that must not be produced in the country are to be calculated at market prices, delivered at the farm (for instance concentrated foods).

The best distribution of the cost of labour is according to the number of work days, distinguishing between summer and winter work days, and between the work of men and that of women (Method of the Deutsche Landwirtschafts-Gesellschaft and of Laur). The cost of management is included in the general expenses and distributed with these.

For the distribution of the cost of manuring within the rotation, the writer recommends two simple methods, of which one considers the unexhausted manure given, and the second assumes that the amortization is balanced by the subsequent manuring. The first method starts from the money value of the original quantity, to which the cost of applying the manure is added, and one half of the total is debited to the second crop. In commencing this calculation it should be sufficient to determine the amount of manure given during the last three years and then reckon one half of the manure given the last year, one quarter that of the second year and one eight of that of the third year. The gain in nitrogen due to the roots and stubbles of leguminous plants may in both methods be considered as manure. In the second method the meadows and every rotation are considered as units which are debited with a certain amount of manure. The cost of manuring is divided, within each rotation, among the various crops in proportion to the gross yield of each. This method gives approximately accurate results so long as the rotation is kept uniformly manured.

For several practical reasons the calculation of the cost of production according to the analytical method, as well as the book-keeping by double entry upon which it is based, cannot be carried out on peasants' farms. On these only the synthetical method (Gesamtkalkulation), based upon a system of book-keeping by single entry uniformly carried out, can be applied, and this also only by strict comparative working up of the results of a large number of farms. In this synthetic process the difference of the net revenue (Reinertragsdifferenz, or difference between the net revenue and the normal rate of interest of the farm capitals which concur in yielding product) is expressed as percentage of the gross revenue, which percentage gives the difference between the cost of production and the prices of the products. If the unit price of a product is known, its cost of production can be easily calculated.

In specialised farms, the risk and consequently the difference of the net revenue, in the calculation of the cost of production of the principal product, may devolve entirely upon this product. Thus, for instance, the production of milk in a dairy farm. It follows that the synthetic method is convenient for the calculation of the costs of production, especially for the central offices of agricultural book-keeping for peasants' farms, which are in a position to group the farms according to the most varied points of view.

The manner of calculating the gross returns and the expenses has the greatest influence on the results. The writer understands by "gross returns" the result of agricultural activity that is expressed by the quantity and the value of the commodities that are produced, transformed or also only newly acquired (according to Laur) by this activity. These gross returns are calculated: 1) from the cash account, 2) from the amounts of produce in kind supplied to the farmer's household, family and employees, 3) from the changes in the inventory in the course of the year. The products supplied in kind are chiefly to be valued according to the market prices at the farm. On the other hand, the valuation of the inventory should be made according to the cost of acquisition, so long as this is not in excess of the realisation prices. The writer gives the tabular form adopted by the Swiss Peasants' Secretariat for the calculation of the gross returns and their distribution among the various accounts. Even if this calculation of the gross returns does not include completely and exactly some accounts and some groups of capitals (plantations of trees and vines, and live stock) and therefore keeps the total gross returns somewhat too low, the result of the calculation of the cost of production is not thereby much affected and at most to the average extent of about ½ per cent.

The working expenses consist ultimately of labour and capital, the fundamental factors of agricultural production, because in farming undertakings even the natural factors appear from the economic point of view as capital.

In the valuation of labour, the value of the management and capacity of organizing possessed by the farmer has also to be considered, as well as the labour of the other members of his family, which have to be reckoned somewhat dearer than that of strangers.

The capitals employed in farms are divided by Laur into "elementary capitals", which he arranges into higher groups. For the calculation of the interests that each elementary capital is to bear he gives the following rates:

For capital in land		3.5 to 4	per cent.
» » in buildings, improvements and forest trees		4 to 4.5	»
» » in fruit trees and vines		5 to 5.5	»
» » in standing crops		6	»
» » in live stock	productive stock	5.5 to 6	»
	draught animals	5	»
	fattening »	4.5	»
» » in machines and implements		4.5	»
» » circulating ccpital (provisions and cash).		6	»

Thus an average rate of interest is 4 to 4.5 per cent. for the total capital (taking into account the proportion of the various elementary capitals that make up the total capital the interest would be 4.3 per cent.).

Besides their demand for interest, capitals weigh upon production for amortization and upkeep, insurance and taxes. The cost of upkeep concerns especially the capital invested in improvements, buildings, machines and implements. Average figures are not easy to give, for the amount of amortization depends to the greatest degree on the nature of each item of capital. The writer gives the figures as they have been determined by the Swiss Peasants' Secretariat. As for taxes the writer recommends that all the State taxes, or at least all the communal taxes which weigh on the farms as land tax, should be included in the working expenses. In the conclusion of this first (general) part he gives in the form of a table a summary for the calculation and division of all the working expenses.

In the second (special) part of his work the writer calculates according to the synthetic method the cost of production of milk in the Swiss peasant farms, basing his figures on the data elaborated by the Bookkeeping Office of the Swiss Peasants' Secretariat during the years 1905 to 1909.

He shows first that the calculation of the probability of errors should be applied to the calculation of the cost of production in order to determine the limits of error in the individual and average results. In the following results of calculations the writer gives, in the tables, the probable mean oscillations calculated according to the usual method of minimal square, so that their ratio to the actual differences of the results to be compared can be easily seen and thus the value of the average results for practical conclusions may be measured.

For the calculation of the cost of the production of milk only the results of typical dairy farms were used: These were further divided:

1) According to the system of cultivation:
   - *a*) Farms based on pastures and meadows.
   - *b*) Farms based on clover-leys, pastures and meadows.
   - *c*) Other farms (based on three-year rotation, or with meadows, pastures and field crops).

2) According to the manner of replacing the live stock:
   - *a*) Farms without breeding stock.
   - *b*) Farms with breeding stock.

3) According to the mode of utilizing the milk:
   - *a*) Farms with retail sale of milk.
   - *b*) Farms with wholesale sale of milk:
     - *α*) in which the milk by-products (whey and skimmed milk) return to the farm,
     - *β*) in which the milk by-products belong to the buyer of the milk.
   - *c*) Farms which work up their own milk.

According to the arithmetical means of the years 1905 to 1909, the average cost of production of 100 kilograms (22 gallons) of milk in all the farms is shown in the table on p. 1088.

The largest item in the cost of production of milk is labour. Doubling the price of land and keeping the rate of interest equal (4 per cent.) does not increase the price of milk by more than about 2*s* per 22 gallons.

An increase of wages in all its phases (direct increase in cost of labour, increase in cost of buildings and capital invested in them, increased price of stores, etc.) increases the cost of production a great deal more than a rise in the price of land.

	s	d	In per cent. of total cost	Number of accounts examined
Total cost	13	2	100	646
Cost of labour	5	4 ½	40.78	644
Interest on the land	1	9	13.37	645
Interest on capital invested	3	4	25.30	641
Interest on working capital		10 3/4	6.81	648
Cost of manures, concentrateds, etc.	3	6 3/4	27.11	648
Price of milk	12	6 3/4	96.45	648

The price of milk in the middle of the period 1905 to 1909 was 3.55 per cent. lower than the cost of production. Since 1905 both the price of milk and its cost of production have risen considerably, and up to 1909 the latter to a greater extent than the former. The increased cost of production was due to the increase in wages and in the prices of commodities, while up to now no influence of the changes in the prices of land has been noticed.

In order to determine the influence of the size of the farm upon the cost of production of milk, the farms included in the table given above were divided according to their extent, and the costs of production were determined for the groups thus obtained. The separate results of the groups do not allow any important effect of the extent of the farm on the total cost of production of milk to be recognized, though some factors are strongly affected: Thus, for instance, the amount of labour expended is greater in small farms than in large ones. A noticeable rise in wages affects the former more than the latter. The stores that have to be bought in the markets seem to be differently influenced by the size of the farm according to the system of farming adopted. The amount of capital invested is relatively larger in the large peasant farms than in the small ones. An increase in the rate of interest affects the cost of production of milk more in the large peasant farms than in the small ones; consequently small farms are more favourably situated than large ones in districts where the prices of land run high.

In order to judge definitely one system of farming as compared with another in regard to the effects upon the cost of production, in the first place the various climatic conditions must be considered. Consequently the farms in which breeding and the wholesale disposal of milk are practised were, within the various groups according to the system of farming, sub-divided again according to the yearly rainfall; the accounts set up for these groups showed: that in districts with above 47.2 inches (120 mm.) of rainfall the pasture and meadow farms produced the cheapest milk, while in districts with less than 43.3 inches (110 mm.) it was the clover, pasture and meadow farms that did so. The ratio between these two types of farms in districts where the rainfall is between 43 and 47 inches cannot be determined from the results at present available. Of the other forms of farms (improved three-year rotation and similar forms) it appears that the production of those receiving upwards of 47 inches of rainfall is dearer than that of the pasture and meadow farms, and that of those getting from 43 to 47 inches is dearer than that of grass and clover farms; in districts with rainfall from 39 to 43 inches, and also below 35 inches, production on such farms is dearer than on the clover farms. Considerably increasing wages favour the grass farms, while strong rises in the prices of commodities favour the clover farms.

Supported by these results the writer recommends, in connection with the production of forage and of milk: 1) in districts having a rainfall higher than 47 inches to keep up the pastures and meadows or to introduce them and to abandon clover farming; 2) to transform the improved three-year rotation in districts with less than 43 inches of rain into clover farms, and where the rainfall is above 47 inches into meadow and pasture farms, and in the intervening districts into clover and grass farms. The decision of the question whether in the last-named districts clover or grass farms are to be preferred rests chiefly with the conditions of the soil and of labour.

As for the influence of the manner of keeping up the dairy herd on the cost of producing milk, it appears from the accounts examined that those farms that only milked purchased cows produced their milk more cheaply during the years 1905 to 1909 than those that bred their milk-stock. The profitableness of the former is due to the high prices of the produce and especially to the lower cost of production. High rates of wages increase the cost of breeding more than they do the production of milk, and thus favour, other conditions being equal, those farms that do not breed. Great rises in the prices of stock, on the other hand, favour breeding farms.

With the object of recognizing the influence of the utilization of milk on the cost of producing it, the groups divided according to systems of utilization (retail or wholesale disposal of milk) were subdivided according to the system of farming, then according to this and to the rainfall. Both calculations agree in attributing a higher cost of production to farms practising retail sale of milk than to those dealing wholesale. The relatively great differences are chiefly due to the expense and work of retailing.

With the increase in the degree of intensity, the cost of the production of milk reduced to unit of returns increases also. Thus the law of diminishing returns holds good also in the production of milk. The gross returns of milk for a certain unit of expense diminish with the increase of intensity. Every addition to the expense causes the produce to become dearer. But the peasant does not seek an absolutely cheap production, but a high profit and respectively a high income from the land. This is also determined by the height of the prices of the produce. The knowledge of the costs of production are not, therefore, sufficient guide in the selection of the most advantageous degree of intensity. The calculation of the cost of production must be completed by a comparison with the current prices of the profitableness of an undertaking. The writer consequently investigates the influence of the intensity of the farm upon the land rent and the income, and draws the following conclusions from the results of his calculations: With diminishing cost (improvement of technique, etc.) and increasing prices of production, the optimum degree of intensity moves upwards. Inversely it moves in the opposite direction: 1) when with stationary cost and returns in kind the prices of produce sink, 2) when with stationary prices of produce and returns in kind the prices of the components of the cost of production rise, and 3) when with stationary returns in kind the prices of produce rise less than the costs of production.

But when it is a question of determining whether it is advantageous or not to diminish the existing degree of intensity of the farm, account must be taken not only of the change in the returns from the land, but also of the net returns of all the capitals employed in the farm and not utilizable elsewhere, as well as of those necessary to the farm; further, in peasant farms the possibility of utilizing completely the available labour must be considered. In general it may be held that the optimum degree of intensity is shifted by changes in the technique, by the height of the prices of the components of the cost of production and by the prices of the products obtained. It follows that the optimum degree of intensity has to be determined for each individual case.

If it is desired to know what prospects of profit a certain kind of production holds out, the changes in the results and the calculation of the returns and of the cost of production caused by the variation in the market conditions have to be examined by a combination of the synthetic method with that of speculative calculation. The results given by book-keeping show the distribution of the gross returns and of expenses on the various items of outlay and gross returns, as well as the ratio of the gross returns to the outlay under the market conditions prevailing at the time. The speculative calculation must then give the mean curve of the changes in prices and examine its effect on these results. The writer accordingly calculates, with the help of a scheme of the distribution of expenses and gross returns, the amounts of the single items in the various kinds of production in the average of the years 1908 and 1909 and the average range of prices for the various products in the years 1910 and 1911 up to the month of April; in his comparative calculations he reaches the following results: The changes in the cost of production caused by the oscillations of prices during the years 1910-11 were more favourable for the grass farms than for the clover farms. For the milk farms without breeding of cattle the oscillations of prices were somewhat more unfavourable than for those that bred also, so that the former, considering the high prices of productive cattle, were no longer in such a privileged condition respecting the latter as they had been a few years previously. Nevertheless they still produce milk more cheaply than the breeding farms.

Lastly an appendix of 123 pages contains in the form of tables the individual results of these calculations of the cost of production for the years 1905 to 1909 for the farms connected with the book-keeping office of the Swiss Peasants' Secretariat.

855 – **The Over-Valuation of Estates.** — BECK, ERNST in *Monatshefte für Landwirtschaft*, Year 6, Part 5, pp. 129-133. Vienna, May 1913.

The first reason of the rapid increase of the value of land is, according to the writer, the fact that farmers at present are able to compare all the producing centres of the world as to their produce and its valuation and thus to form a better judgment on the value of land.

The second reason is in the improvement in the economic power of the class of tenant farmers, who, thanks to the use of abundant capital, have increased the productivity of the soil and consequently enhanced its value permanently.

Still a third reason of the over-valuation of land is that generally the whole returns from an estate are considered as returns given by the land, and thus as a measure of its value, while the interest of the working capital should be deducted from the total returns before calculating the capital value of the land.

Under the term working capital as distinguished from landed capital, the writer defines everything that can be separated from the estate and which on handing over the farm to the lessee remains moveable property of the lessor. On the other hand all improvements of the land itself, plantations of trees, orchards, vines, hops, osier beds, etc., as well as permanent buildings, belong to landed capital. Only the interest returned by the latter, thus the simple rent value, represents the returns of the soil and is to be taken as the basis for the calculation of the purchase price, taking the rate of interest usual in the district for safe securities.

The fourth and most important factor for the valuation of land is therefore the rate of interest: to the same extent that this sinks, does the purchase price of land rise; and as until quite recently the rate of interest has been sinking while the number of inhabitants has increased and the means of communication have improved, the higher valuation of land is easily understood.

But in order to obtain the real returns of the land, which are to be capitalized, it behoves to deduct from the total net revenue that portion due to labour, capital and agricultural capacity. It is only by keeping the installation capital and the working capital rigorously separated from each other that the difficulties encountered in the correct valuation of these capitals can be overcome. Anyhow it is advisable first to establish the value of the returns according to the natural conditions of the soil (Bonität) and then the varying influences of its state of cultivation which increase or diminish its natural capacity of producing. Lastly the writer suggests that the principles adopted by State expropriations be applied by law to the cutting up of large estates (Güterschlächterei) into small holdings in order to protect small capitalists, such as farmers and peasants, against excessive prices for land.

856 - The Form of Wages of Permanent Farm-Hands in Trans-Danubian Hungary (1). — WEISS, RUDOLF in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der K. K. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 591-625. Vienna, May 8, 1913.

The writer gives a brief review of the historical development of agricultural labour in Hungary and of the forms of wages, especially of the payments in cash and in kind. He then shows by means of tables and diagrams the nature of the wages of labour during the last ten years in the 11 counties of Trans-Danubian Hungary, and the ratio between payments in cash and in kind, and gives a description of the latter. The total wages have risen considerably during the last ten years and the proportion of payments in cash to the total has constantly increased.

According to the writer it would be a great mistake in that part of the country to resort to only cash wages, for on the one hand it would lead to the ruin of the labourers owing to their want of economic preparation for such a step and on the other hand, it would be too heavy a burden for the conditions of credit of the farmers. The partial payment in kind should be kept up but it should be connected with an organization that would stimulate the labourers to become thrifty and give them the opportunity of investing their savings in such a manner as to get interest on them and in certain cases to use them as a source of credit.

The chief items of payments in kind are: wheat, milk and the keeping of live stock, the use of fields and gardens, dwelling-houses and fuel. The wages in kind that are not consumed or are saved by the labourers should be bought back by the estates at prices which should be fixed from time to time, and the proceeds together with any increase for numbers of years' service, prizes, gifts and the like should be invested in some safe public bank (Raiffeisen for instance) so as to bring in interest.

In this manner the labourer could, on reaching a certain age, become the owner of some fields or at least get the lease of them for as long as he lived, which would lead to a home colonisation, that, with the further assistance of the State, would create and maintain a superior and settled class of agricultural labourers.

857 - Three Years of Dairy Farming. The Variations in the Results and Their Causes. — OTIS, D. H. in *Hoard's Dairyman*, Vol. 45, No. 9, pp. 341-342. Fort Atkinson, Wisconsin, March 28, 1913.

The writer deals carefully with the variations in the expenditure and returns of the farming years 1909-1910, 1910-1911 and 1911-1912, and the differences thereby shown in the remunerativeness of the undertaking.

Results	1909-10	1911-12	1910-11
Net returns	$ 2 183.00	$ 2 885.89	$ 1 944.98
From this must be deducted interest on capital at 5 %	1 078.25	1 146.20	1 637.25
Profit remaining to farmer . .	$ 1 104.75	$ 1 739.69	$ 307.73

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(1) Under the name "Trans-Danubia" the writer designates that part of Hungary which is bounded on the North and East by the Danube, on the West by Austria and on the South by the Drave.

The sudden fall in the profits in the last year is in the opinion of the writer due to increased capitalization and working expenses.

858 – **A Comparison Between a General Farm and a Dairy Farm.** — OTIS, D. H. in *Hoard's Dairyman*, Vol. 45, No. 7, pp. 259 and 270. Fort Atkinson, Wisconsin, March 14, 1913.

The first is a general farm with grade Shorthorns and grade hogs and is compared with a dairy farm keeping grade Guernseys and pure-bred hogs. The comparison shows that the net returns in the case of the general farm were much below the normal interest on the capital invested, while the dairy farm, in spite of higher expenses and less outlay of capital, was much more paying. The writer ascribes this fact partly to the difference of the products of the two farms, and partly to the difference in management.

859 – **Farming Eight-hundred-Dollar Land at a Profit.** — DACY, GEORGE H. in *Successful Farming*, Vol. 12, No. 3, pp. 54 and 58. Des Moines, Iowa, March 1913.

A description of an estate of 400 acres worth $ 800 per acre and the manner in which it was farmed. Owing to intensive and skilful cattle and pig breeding the yearly profit is 4 per cent. on the total capital expended.

860 – **The Importance of Public Valuation Offices for Estates and Farms.** — ROTHKEGEL, WALTER in *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 13, pp. 102-106 and No. 16, pp. 110-111. Berlin, April 14 and 21, 1913.

The importance of the correct valuation of landed property according to income-tax and ground-tax, or the total value.

Alterations and adaptations to present requirements. The organization and work of the projected valuation offices : local valuation offices, central office ; drawing up and making valuation tables («Tax rahmen») of the sale prices of estates. Advantages of these measures for the reform of the rights of expropriation, for the alteration of the principles of legal taxation, for the science of agricultural practice, for agricultural statistics and practical estate management.

AGRICULTURAL INDUSTRIES.

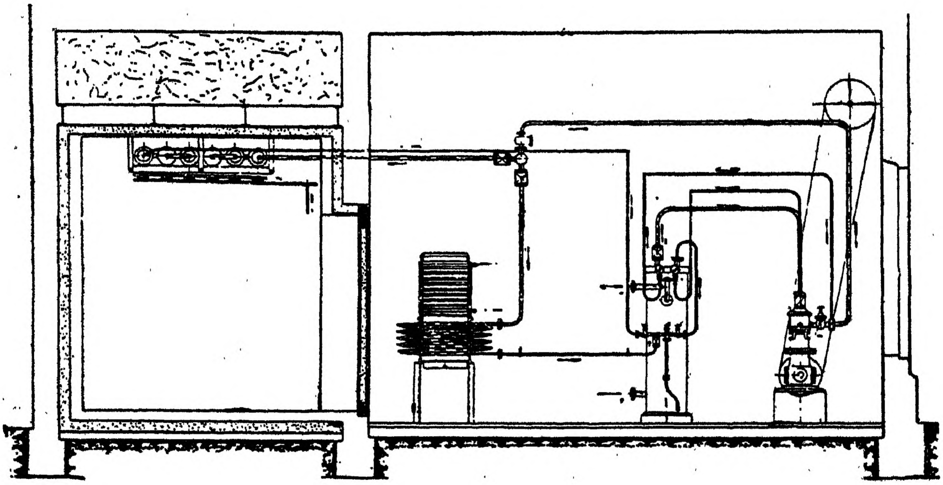
861 – **The Use of Cold in the Dairy.** — RÜTERS, P. in *Zeitschrift für die gesamte Kälte-Industrie*, Year 20, Part 5, pp. 95-101. Munich, May 1913. DAIRYING

According to a lecture given by the writer at the Congress of the «Deutscher Kälteverein» (German Association of the Refrigerating Industry) dairies can be divided into three principal groups. The first group, to which most dairies belong, comprises purely rural concerns. They deal almost exclusively only with the manufacture of butter, and can treat about 880 gallons of milk per diem. They possess machines for measuring the quantity of milk used, for separating the cream, for heating the milk and churning the cream.

The second group is that of town dairies which by retailing the milk directly to the public sell it more advantageously. The size of these dairies varies very considerably. Some deal with only 220 gallons a day, others attain 22 000 gals. The third group utilizes milk in various ways and possesses an industrial character.

As for the application of cold, it may be said that the cooling apparatus of the rural dairies are the easiest to handle and the cheapest. After the cream has been warmed it is immediately cooled, mostly with well water and brine to 2 to 4° C.

This cooling is done in the cream coolers at present used, namely large vessels provided with cooling worm, cooling pipes or double sides, through which cold water, sometimes brine, circulates. Frequently boxes filled with ice are suspended in the cream, or frozen milk is mixed with it.



For town dairies the refrigerating machine is a necessity. Direct evaporation in the milk cooler is preferred, as the action of the refrigerator is much greater than with the brine cooling.

The annexed figure shows an installation of this kind with direct evaporation in the milk cooler and with a system of cooling pipes.

In the third group of dairies, those that work up the milk industrially, cooling is so far important inasmuch as it allows the milk to be kept at a low temperature until required for the various processes to which it is subjected.

862 - **Modifications in the Composition of Cows' Milk Due to the Use of Drugs.** — LANZONI, OLIVIERO in *La Clinica Veterinaria*, Year 36, Parts 1 and 2, pp. 11-23 and 58-69. Milan, January 15 and 30, 1913.

The writer has studied from the experimental point of view the variations in the percentage composition of cow's milk due to the use of certain drugs.

The substances chosen were: 1) sodium sulphate, 2) magnesium sulphate, 3) rhubarb, 4) aloes, 5) arsenic; all of these are much used in every day medical treatment.

The bibliography of the subject does not include any treatise dealing directly with the question; the works of Malapert, Porcher and others (Peligot, Labourdet, Reveil, Fehling, Sigalas and Dupouy, Baum, Strumpel, Flamini, Van Itallie, Nicloux, Oui, Fieux, Leclainche, Lewald, Harnier, Henry, Orfila, Falke, Simon, Marchand, Rombeau, Roseleur, etc.) mention the possibility of certain drugs passing into the milk, but do not consider the changes in the percentage composition of the latter which may be due to their agency. Such modifications, as is well known, depend not only upon medicinal compounds, but also on many other factors: 1) breed, 2) age, 3) time of milking, 4) general conditions of living, 5) work, 6) pathological conditions, 7) physiological conditions (heat, gestation, castration), 8) massage of the udder (*mastagogia*), 9) feeding, 10) air, 11) individuality.

All possible precautions were taken to eliminate the influence of these other factors and to avoid any modifications due to the latter being attributed to the effect of the drugs.

Two samples of milk were taken from each cow, one before and the other after the administration of the medicine, and the differences due to the latter were noted. The cows which furnished the samples for analysis were kept quiet in the shed and fed exclusively upon hay during the absorption of the drug and the period immediately following this. The second sample was taken 24 hours after the dose had been given. The purgatives (saline and cathartic) were administered once, while the arsenic was given in repeated and progressive doses (from 80 cgr. to 1 gr.).

The results of these experiments, as regards the different components of milk, may be summarized in the following manner:

1) The *total solids* show an increase with the salts (+ 0.81 % with sodium sulphate; + 2.64 % with magnesium sulphate), while a diminution occurs with the drugs and arsenic (— 1.38 % with rhubarb, — 1.40 % with aloes, — 1.46 % with arsenic).

2. The *fat* undergoes the most marked alteration: with the salts it increases to a considerable extent (+ 0.94 % with sodium sulphate, + 2.05 % with magnesium sulphate), while it diminishes with the drugs and arsenic (— 0.80 % with rhubarb, — 0.14 % with aloes, — 0.26 % with arsenic).

2. The *casein* is the next most variable compound; it increases with the salts (+ 0.19 % with sodium sulphate, + 1.03 % with magnesium sulphate), while it diminishes with the drugs and arsenic (— 1.50 % with rhubarb, — 1.91 % with aloes and — 0.95 % with arsenic).

4. The *albumen* present increases in all cases (+ 0.02 % with sodium sulphate, + 0.10 % with magnesium sulphate, + 0.04 % with rhubarb, + 1.43 % with aloes and + 0.09 % with arsenic).

5. *Milk sugar* (lactose) diminishes with all the medicines except rhubarb (— 0.26 % with sodium sulphate, — 0.28 % with magnesium sulphate, — 0.75 % with aloes, — 0.26 % with arsenic, + 1.01 % with rhubarb).

6. The *ash* constantly diminishes (— 0.08 % with sodium sulphate, — 0.26 % with magnesium sulphate, — 0.13 % with rhubarb, — 0.03 % with aloes, — 0.08 % with arsenic.

7 and 8. *The density of the milk and of the milk serum* show only slight variations; they are increased by the salts (*density of milk*: + 0.004 with sodium sulphate, + 0.004 with magnesium sulphate; *density of serum* + 0.002 with sodium sulphate, + 0.004 with magnesium sulphate), but diminished by rhubarb and arsenic (*density of milk*: — 0.002 with rhubarb, —0.004 with arsenic; *density of serum*: — 0.002 with both rhubarb and arsenic); with aloes there is no change in either).

The writer comes to the following conclusions based on the above results:

1) It is very probable (leaving out of account the question of the passage of rhubarb, aloes and arsenic into the milk) that sodium and magnesium sulphates do not find their way into the milk (contrary to Malaperts' statements).

2) The salts, rhubarb, aloes and arsenic actually produce considerable alterations (physiologically explicable) in the chemical composition, and these affect the chief nutritive constituents of the milk.

3) This alteration may consist in the loss of all nutritive property owing to the great decrease in the total solids, or it may be that the milk is unsuitable as a food (*e. g.* from an excess of casein rendering it indigestible); but in any case, being of pathological origin, such milk is not hygienic, and should not be sold except for special purposes and under the name of " medicinal milk ". This last conclusion is the principal result of the experiment.

863 – **Chemical Changes Produced in Cows' Milk by Pasteurization.** — RUPP, PHILIP, *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* 166, pp. 15. Washington, April 22, 1913.

The writer mentions that one of the objections frequently raised against pasteurized milk is that the heating produces changes in the chemical composition which makes it unsuitable for infant nourishment. It is claimed that a portion of the soluble phosphate of lime becomes insoluble, and that this change produces defective nutrition; while the changes in the lactalbumin and in the casein render the pasteurized milk more indigestible than raw milk, and therefore inferior as a food.

The objects of the works herein described were to study the chemical changes produced by the heating of milk at the different temperatures used in commercial pasteurization, and to determine whether a temperature that detroys all pathogenic germs can be used in pasteurization without having any appreciable effect on the chemical composition of the milk.

The milk was pasteurized in a constant temperature bath; the water having reached the required temperature, the cool milk, in an Erlenmeyer flask closed with a valve to prevent evaporation, was placed in the water and occasionally moved about until it had acquired the temperature of the water. This usually required from 15 to 20 minutes, according to the height of the temperature. It was then allowed to remain for 30 minutes, after which it was rapidly cooled to about 53° F.

The writer studied separately and carefully the changes in the phosphates, in the proteins and in the acidity of the milk.

He gives the results obtained by other investigators and describes the methods of filtration, analysis and coagulation (of the casein) employed in his researches.

His summary and conclusions are as follows :

1). Milk pasteruized by the " Holder " process at 145° F. for 30 minutes does not undergo any appreciable chemical change.

2). The soluble phosphates of lime and magnesia do not become insoluble. At 155° F. the quantity of phosphoric acid, lime, and magnesia in the serum of both raw and pasteurized milk is practically the same.

3). The albumin does not coagulate at 145° F., but at 150° F. 5.75pers cent. of the albumin is rendered insoluble. As the temperature incre ase the amount of coagulated albumin increases. At 155° F. the quantity is 12.75 per cent. and at 160° F. it amounts to 30.78 per cent.

4). The time required for coagulating the casein by rennin is slightly less in milk pasteurized at temperatures up to 149° F. than it is in raw milk. At 158° F. there is a slight retardation, while at 167° F. the time is almost twice as great.

5). The acidity as determined by titration, is slighty diminished in pasteurized milk.

864 - **A Study of the Bacteria which Survive Pasteurization.** — AYERS, S. HENRY and JOHNSON, WILLIAM T. *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* No. 161, 66 pp. Washington, March 11, 1913.

After a short introduction showing the importance of the investigation in question and giving the results of previous experiments on the subject, the writers treat of the general and special object of their investigations and describe their methods of work.

Having collected information respecting the methods of pasteurization employed in the United States, the writers examined the bacterial results. They studied the quantitive reduction in the bacterial flora in connection with the temperature and the duration of the process, the effect of low temperatures on pasteurized milk, the nature and products of the surviving bacteria, both from a quantitive and qualitive point of view, the fatal temperatures for each of the different groups of bacteria, etc.

The experiments were carried out in the laboratory in such a manner as to preclude any reinfection and to ensure that the bacteria which had survived pasteurization were undoubtedly those that were not destroyed by the given temperature.

In the great number of the experiments a temperature of 145° F. for 30 minutes was used as being that most frequently employed in the United States in the Holder pasteurizing system. Nevertheless, higher temperatures were also used in order to study the variations produced in the groups of the surviving bacteria.

Raw milk contains four chief groups of bacteria : the acid, inert, alkali and peptonizing groups. The acid group is divided into two sub-groups: the acid-coagulating, which coagulates milk in less than 14 days, and the acid group, which merely produces acid and does not coagulate milk within 14 days. In raw milk the inert group is the largest. In milk pasteurized at 145° F. the great increase in the proporion of the acid-coagulating and acid group is plainly shown. The percentages of the alkali and peptonizing groups are reduced. At 160° F. the total acid group is still the largest, but the acid-coagulating sub-group is made up of bacteria which coagulate very slowly. At this temperature the alkali group is greatly reduced and the peptonizing is reduced to a minimum. At 170° F. the total acid group remains about the same, but the organisms produce acid and coagulate very slowly. The alkali group is practically destroyed, although occasionally a sample may show a fairly high percentage. At this temperature the percentage of the peptonizing group to the total bacteria begins to increase. The increase when milk is pasteurized at 180° F. is even more striking 75 per cent. of the bacteria which survive being peptonizers. None of the acid-coagulating group are found and only a small percentage of the acid group, while occasionally a few of the alkali group occur. These proportions are maintained almost constant with temperatures of 190° F. and 200 F.

The bacterial flora of pasteurized milk thus depends chiefly on the temperature of the process, and the figures given by the writers summarize in a general way the most important results of their investigation.

865 – **A Comparative Investigation of the Digestibility of the Protein of Raw Milk and of Milk Desiccated at High Temperatures.** — AVIRAGNET, DORLENCOURT, and BLOCH-MICHEL in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 15, pp. 885-887. Paris, May 2, 1913.

The digestion experiments with desiccated milk were carried out by the writers in the following manner : The milk powder was first dissolved in tepid water, after which the total nitrogen content of the solution was determined. To every 100 cc. of this solution were added 50 cc. of liquid trypsin (trypsin in chloroform water) and the mixture was equally divided between 10 Erlenmeyer flasks. The writers investigated one flask at once to ascertain the amount of diamide (NH_2) liberated by the commencement of the digestive process ; the other nine were placed in a temperature of 37° C., after their contents had been made strongly and equally alkaline by the addition of sodium carbonate.

One flask was taken out of the thermostat every half hour for the estimation of the diamide.

The investigation of the digestibility of the raw milk protein was carried out in the same way ; the amount of nitrogen liberated during digestion was the same in each case.

From a comparison of the results of the two experiments, it is to be concluded that the proteins of desiccated milk are digested more thoroughly, although not more rapidly, that those contained in the raw product. This difference is, in the writers' opinion, to be attributed to a molecular change due to the desiccation process.

866 – **The Effect of the Salts of the Rare Earths upon the Coagulation of Milk by Rennet.** — FROUIN, ALBERT and MERCIER, VICTOR in *Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, Vol. 74, No. 17, pp. 990-991. Paris, May 16, 1913.

In this experiment 10 cc. of milk were placed in each of a number of glass vessels with different amounts (0.1 to 1.8 cc.) of a 1 per cent. sulphate solution and kept during 10 minutes at a temperature of 38 to 40° C.; to each vessel was added the same amount of rennet, and all of them, together with controls, were placed in a thermostat for coagulation. The effects of the sulphates upon this process are shown by the following tables (which are abridged).

Amount of Sulphate in 10 cc. milk	Number of minutes required for coagulation with :					
	Cerium Sulphate	Lanthanium Sulphate	Neodymium Sulphate	Praseodymium Sulphate	Samarium Sulphate	Thorium Sulphate
0,1	20	19	16	18	19	17
0,2	19	18	16	17	18	15
0,5	14	15	14	14	14	12
1,0	9	11	10	10	10	9
1,4	7	9	7	8	8	8
1,8	5	7	6	6	7	6
	Coagulation time of control milk:					
	21	21	19	21	21	19

This table also shows that the sulphates of the rare earths hasten coagulation. According to previous experiments of the writers, the chlorides have the same effect.

867 – **The Manufacture of Cheddar Cheese from Pasteurized Milk.** — SAMMIS, J. L. and BRUHN, A. T. — *The University of Wisconsin Agricultural Experiment Station, Research Bulletin* No. 27, 248 pp. Madison, 1912.

The continued improvement of the cheese-making industry calls for more economical factory management. The writers are of opinion that large well-equipped factories should replace many of the small poorly supported factories of the present time. A new method of cheese-making is needed, by means of which milk of variable quality from many farms can be brought into practically uniform condition for cheese-making at the factory, and be made up into cheese in a uniform, routine manner daily, without variations of time or method of handling. The new method should produce cheese of greater uniformity and avoid the present common losses in yield and quality due to defective milk.

During the years 1905-1906, experimental cheese was made, omitting the starter, and in its place, adding various commercial acids to the raw milk. The method of adding acid to milk was perfected, and a two weeks' trial of the process was finally made in a commercial factory at Muscoda, Wis. It was shown that the addition of hydrochloric acid to milk is entirely practicable at cheese factories, and that the quality of the cheese is not in any way injured by such an addition; but it was also found that the quality of cheese obtained from over-ripe or tainted milk was no better than by the use of the ordinary factory methods. Therefore there was no reason for recommending the use of hydrochloric acid to cheesemakers at that time.

Most of the defects observed in cheese factory milk are of bacterial origin. In other branches of the dairy industry, pasteurization is successfully employed to overcome these faults. In 1907, a few lots of milk were pasteurized in a discontinuous pasteurizer, and then acidulated with hydrochloric acid, and the cheeses obtained were such as to demonstrate the importance of further study.

In 1908, equally good results were obtained by use of the continuous pasteurizer. Heating to 160° to 165° F. was found sufficient to check effectually bacterial action in milk for cheese-making purposes. Bacterial counts showed that over 99 per cent. of the total bacterial content of the milk was destroyed at this temperature. The use of higher temperatures was shown to be objectionable, on account of the effect on the quality of the cheese.

In 1909, cheeses were made almost daily both by the regular factory process, and by the new process from pasteurized milk. The regular milk supply was thoroughly mixed each day and divided into two lots, for the two processes. After curing, the cheeses made from pasteurized milk were found to be cleaner in flavour than the raw milk cheese and superior to it in texture. The difference was more marked the poorer the quality of the milk supply. Many of the details of the process were studied and improved.

In 1910, the making of cheese by the two methods, for comparison, was continued, and the entire output of pasteurized milk cheese was sold to retail grocers, mostly in the city of Madison, to determine how these cheeses would suit the trade. They met with a ready and continued sale. It was noticed that the yield of cheese was regularly somewhat greater by the new process than by the old.

In 1911, better facilities were provided for weighing large quantities of milk and cheese quickly and accurately, and the yields of cheese obtained from raw and pasteurized milk were carefully determined. A greater yield of cheese was always obtained from the pasteurized milk than from raw milk; so that after paraffining and curing, the gain in yield of pasteurized milk cheese over raw was 4.22 per cent. The total loss of fat in whey and drippings from vat and press, using pasteurized milk averaged 1.58 per cent.

of the weight of the cheese, or less than half of the usual loss in handling raw milk.

In addition to this saving of fat, it is found that a somewhat larger proportion of moisture is incorporated in pasteurized milk cheese than in ordinary cheese, without damage to the quality. The gain in yield of pasteurized milk cheese is therefore due partly to fat and partly to moisture.

Scores and criticisms given by competent cheese judges show that the pasteurized milk varied less in quality and averaged better by 3.7 points of total score, than the raw milk cheese made from portions of the same milk supply. The pasteurized milk cheese scored higher than the raw milk cheese in 96 per cent of all cases.

Since pasteurized milk cheeses can be cured without injury at 70° F.., it is likely that in many cases the expense of cold storage for these cheeses can be avoided. Pasteurized milk cheeses can be put into cold storage at 34° F. at the age of one week, and possibly earlier, without injury. The earlier they can be put in storage, if this is done at all, the greater will be the gain in yield by the process. It is planned to study the cold storage of these cheeses further.

During 1910-1911 about 2100 dollar's worth of pasteurized milk cheese was sold to about fifty dealers, both wholesale and retail, in various large cities, from New York to San Francisco. The cheese sold readily for the ruling market prices and often above. Very few dealers offered any objection to them, and several wished to buy them regularly. In general, the cheeses passed the market without exciting special comment, selling for full price, and giving satisfaction. There appears to be no reason why pasteurized milk cheese cannot be sold regularly in any market, with entire satisfaction, excepting possibly to the limited trade that demands very high-flavoured cheese.

In the method described by the writers, a principle is applied to cheese-making which has been found useful in many other lines of manufacture: the raw material, milk, is first treated by a preliminary process to bring it into uniform condition before it enters the manufacturing process proper. Material of uniform quality, thus prepared, is made up into the finished product by a uniform routine process, and the product is more uniform in quality, has better keeping qualities, etc., than the product obtained by the older process.

The difficulties met hitherto in making American Cheddar cheese from pasteurized milk are :1) that heated milk coagulated poorly with rennet, and 2) the curd when obtained does not expel moisture precisely as raw milk curd does, this effect being more marked the higher the temperature of pasteurization. The quality and behaviour of pasteurized milk curd suggest that it lacks the acid, which is normally produced in raw milk curds by the action of bacteria on milk sugar.

The first of these difficulties, but not the second, can be overcome by adding calcium chloride solution to pasteurized milk. This method has been tried experimentally, but is not recommended for use in American cheese factories. Both difficulties are overcome by adding an acid, preferably hydrochloric acid, to the pasteurized milk. Hydrochloric acid is normally present in the human stomach during the process of digestion, in larger proportion than that added to milk in this process of cheese-making. Further, 95 per cent. of the added acid passes out of the cheese into the whey, during the process of manufacture. On this account, no objection can be made, on sanitary grounds, to the use of this acid in the manner and for the purposes described.

Pasteurization and acidulation of milk for cheese-making appear to be complementary processes. Used together, they furnish a means for bringing milk daily into uniform condition, both as to acidity and bacterial content, for cheese-making purposes.

The acidulation of milk with hydrochloric acid after pasteurization is accomplished without difficulty or danger of curdling, by running a small stream of the acid of normal concentration, into the cooled milk, as it flows from the continuous pasteurizer into the cheese vat. One pound of normal strength acid is sufficient to raise 100 pounds of milk from 16 per cent. to 25 per cent. acidity (calculated as % of lactic acid). The amount of acid needed each day to bring the milk up to 25 per cent. acidity is read from a table, or calculated from the weight of the milk and its acidity, determined by use of Mann's acid test (titration with $N/_{10}$ NaOH and phenolphthalein).

After the milk is pasteurized and acidulated, 75 per cent. of first-class starter is added, and the vat is heated to 85° F. It is set with rennet, using two ounces rennet per 1000 pounds of milk, so that the milk begins to curdle in seven minutes, and is cut with $^3/_8$ inch knives in twenty-five minutes. All portions of the day's work, after adding rennet, are carried out in routine manner according to a fixed time schedule every day, so that the cheesemaker is able to calculate the exact time of day when each of the operations should be performed, and the work of making cheese is thus simplified and systematized. It is possible that the routine process here described may be varied somewhat, with advantage, at different factories.

Preliminary estimates show that the maximum extra cost of the new process may be 45 cents for 2000 pounds of milk, with many chances for reducing the cost in handling larger quantities. Because of the increased yield of cheese, the saving in rennet, and in cold storage charges, there is a saving of about $ 2.23 in handling 2000 pounds of milk. Deducting the extra costs of making from this figure, there is a gain of $^7/_8$ of a cent a pound on the selling price of cheese. The profits per pound will be increased where larger quantities of milk are handled and the losses in yield, quality and selling price, which factories often suffer, because of defective milk, will be avoided through pasteurization.

It should not be supposed that sanitary conditions of milk production may be neglected on a farm, as the result of using this process at the cheese factory. In all cases it is to be expected that the better the milk used, the better the quality of the cheese will be.

It is the intention of the writers to give the new process a thorough trial in different cheese factories in different localities, before recommending it for general use by cheesemakers.

868 - **The Bacteriology of Cheddar Cheese.** — HASTINGS, H. G., EVANS, ALICE C. and HART, E. B. — *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin* No. 150, pp. 52. Washington, October 1912.

After a brief general introduction, the writers treat in a detailed manner of the action of *Bacterium lactis* and of other groups of bacteria, cocci, etc., upon Cheddar cheese.

The following is a summary of results of their investigations :

1. From the same raw materials various kinds of cheese are prepared, which differ especially in flavour. The factors that determine whether a cheese prepared from a given mass of milk, rennet and salt, is to be of one kind or another are to be found in three methods of the cheese maker, who is able to vary in one way or another the composition of the cheese, with the result that conditions are established that favour or retard the growth of the groups of micro-organisms, which must be the determining factors between different kinds of cheese.

2. The only group of bacteria found constantly in great numbers in Cheddar cheese by previous investigators is the *Bacterium lactis acidi* group. The functions of this group in Cheddar cheese, are, through their chief by-product, lactic acid :

a) To favour the curdling of milk by rennet.
b) To influence the shrinking of the curd and expulsion of the whey.
c) To change the nature of the curd and cause " matting ".
d) To activate the pepsin of the rennet extract.
e) To prevent the growth of putrefactive bacteria in the cheese.

3. It has been shown that *Bacterium lactis acidi* is able to form acid in the absence of the living cell.

4. The development of *Bacterium lactis acidi* is followed by the growth of another group of acid-forming bacteria, the *Bacillus bulgaricus* group. These attain numbers comparable with those of the first group, reaching their maximum within the first month of the ripening. Since they develop after the fermentation of the sugar, they must have some source of carbon and of energy other than milk sugar.

5. It is probable that coccus forms are constantly found in large numbers in Cheddar cheese.

869 - **Experiments in Making Camembert Cheese according to the Von Mazé Method.** — KLOSE in *Molkerei-Zeitung*, Year 27, No. 41, pp. 795-797. Hildesheim, May 30, 1913.

The writer makes a few introductory remarks regarding the different factors which hinder the normal ripening of cheeses, and then speaks of the method recommended by von Mazé of Paris for obtaining a good, thoroughly ripe, soft, French cheese. In principle, the von Mazé method consists in heating the milk to be used for cheese-making for 10 minutes at 62° C. (148. 6° F.) and subsequently cooling it to 40° C. (104° F.), after which is added a lactic ferment cultivated according to special rules in pasteurized skimmed milk. Before the rennet is introduced a second amount of the pure culture is added, and the cheeses are sprinkled with dry cultures when in the ripening room.

The von Mazé system differs from the method usually employed in making soft cheeses, in that it always ensures a normal ripening. The writer has investigated the process and made Camenbert cheese both according to the von Mazé method and according to the ordinary methods, showing thereby that there were no differences in the two kinds of cheese, except those involved in the actual manipulation. In both cases the coagulation was normal, but in that of cheeses made after the von Mazé method, the whey appeared to separate more quickly. The amount of curd was the same, but the writer noticed that cheeses made according to the usual methods ripened somewhat sooner. Only in two out of five times did the cheeses prepared by the von Mazé system show any superiority in flavour. It would thus appear that this method does not present any special advantages over that usually adopted in making Camembert cheese.

MEAT INDUSTRY

870 – **The Reorganization of the Cattle and Meat Trade in France.** — LUCAS in *Annales de la Science agronomique*, Year 30, No. 4, pp. 241-266. Paris, April 1913.

The writer first investigates the amount of the annual meat production in France and the consumpetion of meat in that country (1). The results are given in tabular form and according to them 20 296 394. cwt. of beef are supplied annually for home use, 3 848 638 cwt. of mutton, and 17 024 480 cwt. of pork. If to the imported meat is added also the rabbits, game, goat and horseflesh, and the amount exported subtracted, the annual consumption per head of the population is about 132 lbs.

In the following section, the writer investigates in how many of the Departments the supply meets the demand; which export and which import cattle for the butcher, and how many of such cattle are exchanged between the different Departments: Of the total number, in six the supply just meets the demand, in 50 there is a surplus, and 31 import beef; while the trade betewceen the different Departments accounts for 550 000 head of cattle. 45 Departments import sheep, 42 export them, and 4 400 000 sheep (including 2 million lambs) are exchanged. In 42 Departments the supply of pigs exceeds the demand, and 2 200 000 head of these animals are annually on the market.

Those Departments which produce more meat than they require are chiefly situated in Central and Western France. The Northern, Eastern and Southern Departments, and also the Gironde, import cattle; some districts (Morvan, Limousin, etc.) are able to export cattle regularly throughout the year; $^2/_3$ of the animals exported by the provinces are sent to Paris and, of these, $^2/_3$ find their way to the La Villette market (2) and $^1/_3$ go directly to the abattoirs. 41 per cent of the animals sent to the market are again despatched from Paris and sent either abroad, or back to the provinces.

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(1) See No. 595, *B.* May 1913.

(2) See also No. 180, *B.* Feb. 1913. (*Ed.*)

Paris is therefore the great centre of the cattle and meat trade in France, though there is a certain amount of trade in the provinces; the price of cattle, moreover, is fixed at the La Villette market.

The prices at the latter, however, are not always regulated by supply and demand, but are liable to manipulation, and as an unexpected fall in prices at La Villette affects the trade of the whole country, the unreliable nature of the market quotations is a serious disadvantage. The whole trade is also attended with great expenditure, and entails the risk of spreading disease.

The writer is therefore of opinion that the cattle and meat trade should be decentralized. This could be effected by building local abattoirs with adjoining markets in the centres of production, the cost of the erection and maintainance being partially defrayed by the local government.

WINE-MAKING

871 - **The Ferment Producing Bitterness in Wines.** — VOISENET, E. Nouvelles recherches sur un ferment des vins amers. — Le ferment de l'amertume des vins consomme-t-il la crême de tartre? — *Comptes Rendus Hebdomadair es des Séances de l'Académie des Sciences*, Vol. 156, Nos. 15 and 18, pp. 1181-1182 and 1410-1412. Paris, April 14 and May 5, 1913.

In his preceding communications (1) the writer demonstrated that acrolein is formed in the disease of bitterness in wines, and also shewed that a pure species of the ferment taken from a bitter wine, and cultivated in presence of glycerine, rapidly gives rise to acrolein and produces a bitter taste.

In pursuing this investigation, the writer found that this ferment, after having been sown 15 months previously in different sterilized wines, either in their natural state or partially deprived of their alcohol, developed in some cases quite rapidly and exhibited all the morphological characters of the bitter wine ferment. All the samples in which growth had taken place contained acrolein; the amount of fixed and of volatile acids had increased; the colouring matter was partly altered and precipitated, while some of the wines had a more or less pronounced bitter flavour.

The bacillus, called by the writer *Bacillus amaracrylus*, is therefore sufficient to produce the bitter disease of wines, with its organoleptic, microscopic and chemical characters.

Amongst other fermentable substances, it reacts on glycerine, transforming it partly into acrolein, and a specially unstable aldehyde, which undergoes various metamorphoses. Other products are also formed, among which are carbon dioxide, hydrogen and ethyl alcohol, the volatile acids, formic, acetic, and acrylic, as well as another acid insoluble in water, fluid at about 15° C., which appears to be be caprylic acid, and finally the fixed acids, lactic and succinic. This bacillus rapidly consumes mannite and sugars, it has a moderate action on dextrin, and does not ferment erythrite, dulcite, and starch. The fermentation of the sugars, saccharose, lactose, maltose, glucose, levulose and galactose, is complete in the presence of calcium carbonate Saccharoses do not appear to be previously reduced by the ferment; and above all throughout the whole process of fermentation the carne-sugar solution does not reduce Fehling's solution.

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(1) *Comptes Rendus*, Vol. 150, 1910, p. 1614; Vol. 151, 1910, p. 518; Vol. 153, 1911, pp. 363 and 898.

Amongst the transformation products of mannite and of the sugars are found those yielded by glycerine, with the exception of acrolein and its derivatives.

Bacillus amaracrylus seems to be inactive as regards tartaric acid and its salts, especially cream of tartar.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

872 - **The Law of April 1329 (1913) Regarding Agricultural Pests in the Ottoman Empire.** — *Journal Officiel de l'Empire Ottoman et Archives du Ministère de l'Agriculture,* April 15, 1913.

Art. 1. — Any person in a district observing injuries caused to plants by diseases or noxious insects, or by any other cause, known or unknown, is required to at once give notice to the local authorities, who will determine the nature of the injuries and take measures as follows:

Art. 2. — The nature of all plant diseases, as well of insects and other parasites which are harmful to cereal crops, plantations, and plants in general, are to be determined, together with the date of the attack, its importance, the district invaded and the kinds of plants affected. The measures to be adopted, and the time of their application, will be decided by the technical expert, who will present his report to the Vali (Governor-General of the Vilayet), to the Mutesarif (sub-Governor) or to the Kaimakam (Governor of the district). These will, in a suitable manner, acquaint those interested of the fact of the existence and of the nature of the diseases.

Art. 3. — Immediately upon receiving the information from the local authorities mentioned in Art. 2, landowners, farmers and all other persons enjoying the rights of pasturage and of communal forests are required to carry out the measures ordered by the Governmental authority. The control of the strict application of the methods enjoined is in the hands of the technical experts, who are not to be hindered in the discharge of their duties.

Art. 4. — If the injuries occur on an area which is the property of the Vilayet, or on Vacuf land (land bequeathed to the church) or on State land, the necessary measures are at once carried out by the government of the Vilayet, the administration of the Vacuf, or directly by the State.

Art. 5. — Such persons as do not carry out the measures decreed, or carry them out in an unsatisfactory manner, and do not comply with the instructions given for their completion, are liable to a fine of from half a pound to two pounds Turkish.

Art. 6 — Landowners, farmers, etc., are required to at once inform the local Government of the presence of diseases, or of injurious insects. Such persons as do not comply with this order, are liable to a fine of from half a pound to two pounds Turkish. If the diseases are endemic, the statement of a villager is sufficient.

Art. 7. — If the measures enjoined are not carried out by the persons interested within the term fixed by the Government, the local authorities, *viz.* the Vali, the Mutesarifs, the Kaimakams, and the Director of the Commune can severally form a Commission presided over by themselves, and consisting of a member of their own administrative council, of an agriculturist, and a technical expert, who, after estimating the necessary expenses, will take the necessary measures, of which the expenses will be chargeable to the extraordinary budget of the Vilayet.

During the harvest, the sum expended will be collected with interest, according to the law of collection, by the collectors of the Ministry of Finance, and the money deposited in the local bank.

Art. 8. — The measures and the remedies prescribed shall be applied under the direction of the technical expert, and the outlay approved by the committee.

Art. 9. — The fines mentioned in the preceding article are collected in the Vilayets, Livas and Cazas by the competent council, and in the Communes, according to special arrangement by the Communal Council without having recourse to the courts of Appeal and Cassation.

Art. 10. — In case of refusal of payment of the adjudged fine, the competent Council, or the Communal Council, draws up a statement which is sent to the highest civil officer of the place; he reports to the examining magistrate. The examining magistrate, according to Art. 37 of the Penal Code, may substitute immediate imprisonment for the fine.

Art. 11 — The ministries of the Interior, of Justice, of Commerce, and of Agriculture are charged with the carrying into effect of this law.

Art. 12 — This law comes into force on the date of its publication.

873 - **Decree for the Protection of the French Colonies and Protectorates from the Propagation of Plant Diseases.** — *Journal Officiel de la République française,* Year 45, No. 148, p. 4128. Paris, May 12-14, 1913.

Under date of May 6, 1913, the President of the French Republic decreed as follows:

Art. 1. — In view of hindering the propagation of plant diseases due to parasitic animals and plants or to worms or to non-parasitic insects, the Colonial Minister may by special orders, setting forth the disease and the plants susceptible to its attack, forbid the following articles being imported into colonies, or protectorates, other than Algeria, Tunisia and Morocco:

1) Plants subject to the said disease.
2) All other plants with which the disease might be transported.
3) Soil or composts capable of containing these parasites, worms or non-parasitic insects at any stage of their development.

The plants, soils or composts which might serve as a vehicle for this disease are determined, in the event of its occurrence, by decrees of the Governors General and Governors. These decrees are immediately published. The Governors General and Governors inform the Colonial Minister of the fact by telegraph. The entry may also be prohibited of cases, sacks or packing materials which have served in the transport of the prohibited plants, soil and composts.

Art. 2. — In default of any existing prohibition by virtue of the preceding article, the Colonial Minister can, by special decree, determine the conditions of the entrance and circulation in the Colonies and Protectorates of the plants and objects mentioned in the said article. He also fixes the conditions under which the branches, leaves, fruits and débris of the said plants may enter and circulate in the colonies and Protectorates.

Art. 3. — Any person infringing the measures of the Colonial Minister regarding the execution of the first and second articles of the present decree is liable to a fine of from 50 to 500 francs (£ 2 to £ 20).

Art. 4. — Persons who, by means of any fraudulent device, shall introduce into the Colonies or Protectorates dependent on the Colonal Office plants or articles of which the introduction has been prohibited by the Colonial Minister, in accordance with art. 1. of the present decree, are liable to a term of imprisonment varying from one to fifteen months and a fine of from 50 to 500 francs, or to one of these penalties singly.

Art. 5 — The penalties set forth in the two preceding articles are doubled in the case of a second offence. The offence is regarded as a second offence if, during the twelve preceding months, a first sentence has been passed upon an offender according to the present decree.

Art. 6. — If extenuating circumstances can be proved, the courts are empowered, even in the case of a second offence, to reduce the term of imprisonment to less than one month and the fine to below 50 francs, provided the penalties are not made less than the simple police fine.

Art. 7. — The decree of July 26, 1911 (1), is abrogated.

Art. 8. — The Colonial Minister and the Keeper of the Seals, Minister of Justice, are charged, each according to his powers, with the execution of the present decree, which will be published in the *Journal officiel* of the French Republic and inserted in the *Bulletin des Lois* and the *Bulletin officiel* of the Colonial Ministry.

874 — **Proclamation on Plant Protection in Nyasaland.** — The Plant Protection Ordinance, 1912. Proclamation. No. 8 of 1912. — *The Nyasaland Government Gazette*, 287: Vol. XX, No. 1, pp. 3-4. Zomba, Jan. 31, 1913.

Whereas by Section 3 of "The Plants Protection Ordinance, 1912," it is provided that the Governor in Council may by Proclamation to be published in the *Gazette* absolutely or conditionally prohibit the importation directly or indirectly from any country or place named in such Proclamation of any plant or any earth or soil or any article packed therewith or any package or other article or thing which in the opinion of the Governor in Council is likely to be a means of introducing any plant disease into the Protectorate.

And whereas it has been made to appear to me that the importation of cotton plants with the following exceptions should be absolutely prohibited:

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(1) See No. 2378, *B.* July 1911. (*Ed.*).

Exceptions:

1) Cotton plants grown in Egypt.

2) Cotton plants imported for experimental purposes by the Director of Agriculture and packed in double bags or tins.

And Whereas it has been further made to appear to me that all plants permitted to be imported should be imported subject to certain conditions:

Now therefore by virtue of the powers in me as Acting Governor in Council vested as aforesaid I DO HEREBY declare and proclaim that the importation of cotton plants with the exceptions as aforesaid shall be and is HEREBY absolutely prohibited.

And Further that the importation of all plants permitted to be imported shall be imported subject to the following conditions:

1. Every package containing plants imported into the Protectorate through the medium of the Post shall contain a statement containing the full names of the kind and variety, the country of origin, and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B. Such package shall be delivered by the Postal Department to the Agricultural Department, Zomba, for inspection, and disinfection, if necessary. Such package shall, if in order, be delivered to the Post Office to be forwarded to the address without further postal charge. Any package of plants which does not contain the requisite statement and certificate shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine.

2. When plants are intended to be imported otherwise than through the medium of the Post, a statement containing the full names and the kind and variety, the country of origin and the name and address of the person or firm supplying such plants together with any certificate which may be prescribed by Schedules A or B shall be posted to the Comptroller of Customs. Such statement and certificate shall be despatched by the consigner in sufficient time to enable it to reach the Comptroller of Customs one month in advance of the consignment. Plants which reach the Port of Entry, for which the necessary statement and certificate have not been received, shall be detained, pending the receipt of the statement and certificate as aforesaid, and if such are not received within one month subsequent to the arrival of the plants the whole consignment shall be liable to be confiscated or otherwise dealt with as the Agricultural Authority may determine. When plants are imported by persons entering the Protectorate, the importer shall declare the same to the Customs Officer, giving the information required above, and producing the certificate which may be prescribed by Schedules A or B. In the event of the statement and certificate being in order all plants shall be disinfected, if considered necessary by the Agricultural Authority at the Port of Entry, and allowed to proceed. Should any statement or certificate prove to be incorrect, the whole consignment shall be liable to be confiscated.

3. All plants shall be securely packed and should any package become so damaged in the course of transit as to render it possible that any plant may escape therefrom, such package and any plant therein or therefrom, may at the discretion of the Agricultural Authority be confiscated.

The following Proclamations are revoked :

Proclamation contained in *Gazette* Notice No. 49 of 1909.
Proclamation contained in *Gazette* Notice No. 79 of 1909.
Proclamation contained in *Gazette* Notice No. 131 of 1909.

SCHEDULE *A*.

The importation of plants of the following kinds shall be accompanied by a certificate from the official Agricultural Authority of the countries from which the plants originated to the effect that they have been grown in areas known to be free from diseases or pests which characteristically attack such plants :

Rubber of all varieties	from all countries.
Cacao	
Cocoanuts	
Rice	
Tobacco.	
Potatoes	

SCHEDULE *B*.

The importation of plants of the following kinds shall be subject to the permission of the Agricultural Authority being first had and obtained.

Coffee	from all countries.
Tea	

875 – **Regulations on Cotton Growing in Nyasaland.** — The Cotton Ordinance, 1910. Rules. *The Nyasaland Government Gazette*, 287: Vol. XX, No. 1, pp. 5-6. Zomba, Jan. 31, 1913.

1. Every landowner and person planting cotton in the Protectorate shall uproot and burn all cotton bushes on his land or planted by him before the last day of October next following the date of planting of such bushes. Provided that this Rule shall not apply to the Lower Shire, Ruo and West Shire Districts.

2. Every landowner and person planting cotton in the Lower Shire, Ruo and West Shire Districts shall uproot and burn all cotton bushes on his land or planted by him in these Districts before the last day of December next following the date of planting of such bushes.

3. Any bushes not uprooted and burnt in accordance with these Rules may be uprooted and burnt by order of the Director of Agriculture or of the District Resident. In the event of this being done the landowner and the person who planted the bushes shall be jointly and severally liable for any expense occasioned by such uprooting and burning in addition to their liability to the penalties prescribed for a breach of the Ordinance.

Cotton to be ginned in the Protectorate. — 4. All native grown cotton produced up Crown lands from seed issued by Government shall be ginned in the Protectorate.

Reservation of seed to Government. — 5. All cotton seed issued by Government to natives is issued subject to the condition that Government retains the right to any seed obtained from the crop which is the produce of the seed issued. Every licensee purchasing native grown cotton produced upon Crown lands from seed issued by Government, before selling, giving or otherwise disposing of such seed after ginning shall obtain a certificate from the Director of Agriculture that such seed is not required by Government, and if the Director of Agriculture shall intimate that such seed or any part thereof is required by Government the licensee shall hold the quantity specified at the disposal of Government.

Approval of Director of Agriculture. — 6. No cotton seed shall be issued to natives until it has been approved by the Director of Agriculture.

Authority for distribution of seed. — 7. No person except a person authorized by the Governor, shall distribute seed to natives for cultivation on Crown lands. Applications for such authority shall be made in the first instance to the Director of Agriculture.

Licence to purchase. — 8. No person shall purchase native grown cotton being the production of seed distributed for cultivation on Crown lands, unless he shall previously have been licensed so to do under these Rules.

Form of licence. — 9. A licence shall be in the form prescribed by the Governor and shall expire on the thirty-first day of March next following the date of issue. Every such licence shall be obtainable from the District Resident of the District in which the purchase is to be made.

Duty of licence. — 10. The duty chargeable on a licence shall be ten shillings.

Place of purchase. — 11. No licence shall authorize a licensee to purchase native grown cotton in a place other than the place stated in the licence.

Establishment of markets. — 12. For the purpose of the sale of native grown cotton, markets shall be established by Government in native cotton growing districts.

Market tolls. — 13. Purchasers of native grown cotton shall pay market tolls at the rate of 3 *d.* per cwt. of seed cotton purchased. Such tolls shall be paid to the District Resident of the District to which his licence applies concurrently with the submission of the monthly return referred to in Rule 14 hereof.

Monthly returns. — 14. Every licensee shall on the last day of each month make a return to the District Resident of the District to which his licence applies showing the total weight of native grown cotton from Crown lands purchased by him during the month and the price which he paid for such cotton.

Inspection of cotton purchased. — 15. All native grown cotton from Crown lands purchased by a licensee may be inspected at any reasonable time by the district Resident, the Director of Agriculture, or by an officer of the Agricultural Department or by any officer appointed by the Governor, and such licensee shall give all such information as to the place where and the person by whom such cotton was grown or sold or ginned or otherwise as the said inspecting officer shall require and the licensee be able to afford.

Cancellation of licence. — 16. A licence may be cancelled on conviction of the licensee of a breach of any of these Rules.

A new licence shall not be issued to any person whose licence has been so cancelled except by the express authority of the Governor.

Penalty for breach of Rules. — 17. Any person committing a breach of any of these Rules shall be liable on conviction to a fine not exceeding five pounds or in default of payment to imprisonment for a term not exceeding one month.

Repeal. — 18. The following Rules are hereby repealed:

(1) Rules made the 20th December, 1910, and published in the *Gazette* of the 31st December, 1910.

(2) Rules made the 28th June, 1911, and published in the *Gazette* of the 30th June, 1911.

Rules subject to disallowance. — 19. These Rules are subject to disallowance by the Secretary of State.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

876 - **Physiopathological Observations on the Stigma of the Olive Flower.** — PETRI, L. in *Memorie della R. Stazione di Patologia Vegetale, Roma*, IV, pp. 139-160, figs. 1-7. Rome, 1913.

The papillae of the stigma of the flower of the olive are secretory organs. It is the lamella below the cuticule which becomes gelatinous, raising and bursting the cuticle.

The microchemical reactions of this lamella show that it consists of a hemi-cellulose insoluble in cuprammonium solution, not coloured blue by iodised potassium iodide, or by zinc chloride-iodide reagent. It is soluble in boiling 20 per cent. potash and it swells and is easily hydrolized on the addition of dilute mineral acids.

The pollen-tube finds in this mucilage an excellent substratum for its development, and receives from it a strong chaemotropic stimulus. A further stimulating action appears, on the other hand, to be exercised by the pollen tube on the cells of the conducting tissue, and to the enzyme action of these is due, as in the case of the papillae, a partial chemical modification of their walls, which are largely of hemi-cellulose.

This vegetative stimulating action of the pollen-tube is in every case limited to the stigma; after flowering, the ovary may continue to grow for many days, as may also the ovules, independently of pollinisation. This growth is in strict connection with the vegetative condition of the whole plant.

Amongst the external causes which may provoke alteration in the stigmatic papillae and bring about their death, are rain and mist, both of which act by wetting the stigma.

The death of the stigmatic papillae is due to the arrest, or excessive reduction, of the activity of the functions of respiration, transpiration and assimilation. These conditions bring about an accumulation of oxalic acid exceeding the amount which can be tolerated by the protoplasm.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

877 - **Work of the Laboratory for Botanical Research and Plant Diseases at the Royal Imperial Institute of Vine and Fruit Cultivation at Klosterneuburg, Austria.** — *Communicated by* Prof. L. LINSBAUER *to the International Institute of Agriculture*.

One of the principal aims of the Laboratory has been to study vine diseases not only with reference to parasites, but specially on the lines of investigation of the physiology of disease; its work should therefore be judged from this point of view.

In this paper a short description is given of some of these physiological investigations, which naturally extend over a considerable period of time, and as many of them are still incomplete, the following lines should be regarded in the light of a programme.

Pseudopeziza tracheiphila («Rote Brenner») was observed in dry seasons on European vines and also on American vines and on hybrids. It occurred in the typical form, fungus mycelium being in all cases present. The following varieties of vines were attacked: Berlandieri, Monticola, Riparia Portalis, Solonis, Riparia × Rupestris, Mourvèdre-Rupestris, Goethe 9, Schwarzmann-hybrid.

Cuttings of vines affected by this disease were grown under glass and kept as dry as possible in order to determine whether the infection can be conveyed to cuttings by the mycelium entering the stem of the vine. In spite of cultivation for several years in dry air, without dew or rain, and with the scantiest watering, only a single spot due to the fungus was seen. The occurrence of the latter is therefore due in every case to reinfection.

The "Droah" (1) is a vine disease occurring in Lower Austria and almost exclusively in high situations; it is characterized by hindering of growth of the internodes and leaves, and dropping of the flowers. Investigations on the spot lead to the supposition that we have here to do with a manifestation due to winter drought. The disease is of great interest, because the flowers are not all hermaphrodite, but some male and also intermediate (in Rathay's sense) flowers occur. It is proposed to obtain similar changes in the flowers artificially by means of different cultural conditions.

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(1) See also No. 288, *B*. Jan. 1911. (*Ed.*).

Further, the disease has suggested the study of desiccation phenomena in vines. These investigations are at present not concluded. A few preliminary observations suggest that vines only shoot when their water content reaches a fixed average (in a preliminary series of experiments between 31 and 39 per cent.), while with a higher or lower water content no shoots are produced. Whether "Droah" symptoms can be artificially produced by want of water is at present unknown. The relation between "Droah" and the leaf-curl ("Kräuselkrankheit") due to mites has yet to be ascertained.

Another problem is afforded by the diseases of grafts, which are chiefly connected with the question of wood ripeness. These maladies are to be made the subject of investigations, all the more because two points seem to have been shown by the discussion of the views hitherto obtaining respecting wood ripeness.

Firstly, the condition in which we find a so-called "ripe" shoot depends upon unknown causes, which are quite different from those giving rise to the symptoms characteristic of ripe wood. Again while "ripeness of wood" is a useful, practical and pertinent expression, it does not convey a single idea with sharply defined limits.

The question of the entry of the spores of *Plasmopara* into the leaves of the vine, which has lately been answered by Müller-Thurgau (1) in the manner we know, leads to a closer investigation of the foliage of trees as regards the opening and shutting of their stomata. Molisch's infiltration method could be used for this purpose.

Other questions of a purely physiological nature arise from these investigations, which we have cursorily described. They are all based upon the principle which we mentioned at first, *viz.* that the condition of a diseased vine can only be rationally judged when the physiological state of a healthy plant is taken as a basis for comparison.

878 - **A Contribution to the Mycological Flora of East Russia.** — NAUMOFF, N. Travaux de l'Institut de Pathologie végétale de St.-Pétersbourg. Matériaux pour la Flore mycologique de la Russie. — *Bulletin trimestriel de la Société mycologique de France* Vol. XXIX, Part 2, pp. 273-278, fig. XIII. Paris, 1913.

The writer is about to publish the complete list of species collected in East Russia during the summer of 1912, and in the meantime, describes the three following species, which he considers to be new to science; *Bremia graminicola*, on the living leaves of *Arthraxon ciliaris* Beauv.; *Cicinnobolus bremiphagus*, the pycnidia of which were closely attached to the fruiting organs (conidiophores) of the preceding species; and *Rhodoseptoria ussuriensis*, which destroys the leaves and fruit of a plum tree known popularly as the "Manchurian Plum".

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(1) See No. 3232, *B* Nov.-Dec. 1911 (*Ed.*).

879 - **On the Propagation of Rusts among the Gramineae.** — BEAUVERIE, J. in *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences*, Vol. 156, No. 18 pp. 1391-1394. Paris, May 15, 1913.

The writer, in his researches on the propagation of rusts in the neighbourhood of Lyons, has frequently recorded the presence of the resting or reproductive organs of these fungi (mycelium, uredospores and teleutospores) inside the caryopses of cultivated Gramineae (wheat, oats, barley), or of wild species (*Bromus mollis, Brachypodium pinnatum, Agropyron caninum, A. repens*).

The writer considers that the observations he has so far made are insufficient to permit of his expressing any opinion as to the power of these organs to transmit rusts, and therefore proposes to continue his researches and to supplement them by practical experiment.

880 - **The Biology of *Cycloconium oleaginum*.** — PETRI, L. *Studi sulle malattie dell'olivo. III.* Alcune ricerche sulla Biologia del *Cycloconium oleaginum* Cast. - *Memorie della R. Stazione di Patologia vegetale, Roma*, 136 pp., 37 figs. Rome, 1913.

The observations made by the writer refer to four principal questions, some of which have already been dealt with by other investigators: *a*) Cultures of *Cycloconium oleaginum* ("olive pox" or "peacock-eye") on artificial nutritive media; *b*) the germinating conditions of the conidia; *c*) the enzyme action of the fungus upon the cuticle of the olive leaves; *d*) the localization and development of the disease with regard to the condition of receptivity of the leaves.

The researches, partly carried out since 1905, have shown in the first place that *Cycloconium* can be grown saprophytically. In cultures it forms chlamydospores and microsclerotia, and only on an acid substratum does it give rise to conidia. A temperature of from 30° to 32° C. prevents the germination of the latter and also hinders the development of the cultures; the lowest temperature which permits of the germination of the conidia is 2° C., but the mycelium is very resistant to cold (-15° C.). Germination does not take place in water rendered alkaline by the addition of 5 per cent. of sodium carbonate or containing 3 per cent. of tartaric acid. It is also hindered by mercuric chloride at a concentration of 1: 500 000, by: silver nitrate (1: 35 000), gold chloride (1: 30 000), copper sulphate (1 30 000). The resistance to toxic action depends directly upon the reserve substances present in the conidia. The useful action of calcium polysulphides is only temporary; sulphur does not hinder germination.

Two enzymes were isolated from the mycelia of the cultures, the one a pectin, and the other a lipase; the latter attacks the waxy and fatty substances of the cuticle.

Neither in the cultures nor in the leaves were toxic substances elaborated by the mycelium.

The conditions of receptivity of the leaves are governed principally by the richness in pectic substances shown by the cuticularized layers of the external walls of the epidermis and by their minimum cuticularization. This chemical constitution of the membrane depends upon the local conditions of the cells (due to disturbance of some enzyme function), which in their turn depend on pathological vegetative conditions. In the wild olive tree the slight development of the cuticularized layer, which in the cultivated variety is more or less rich in pectic substances, represents a condition of constitutional resistance which is capable of modification by means of cultivation. *Cycloconium* does not find conditions suitable for its development on leaves which are about to fall. The nutrition of the intercuticular mycelium takes place at the expense of the cuticularized layers of the membrane, and at that of the carbo-hydrates and soluble nitrogenous compounds present in the epidermal cells. The germination of the conidia at low temperatures, and the physiological condition of the leaves in winter, render infection at that season possible, especially in southern and littoral districts.

RESISTANT PLANTS

881 - **Connection Between the Acidity of the Cell Sap and Rust Resistance in Wheat.** — COMES, ORAZIO. Della resistenza dei frumenti alle ruggini. Stato attuale della questione e provvedimenti. — *Atti del R. Istituto d'Incoraggiamento di Napoli*, Series VI, Vol. IX, p. 22, Naples, 1913.

The present work deals with the immunity and susceptibility of different varieties of wheat to the attacks of rusts.

The writer first gives a summary of the different results obtained by the various investigators on the subject, and then passes on to the fact, which is well known in practice and has been confirmed by experiment, though no plausible reason has been put forward to explain it, that nitrogenous fertilizers weaken the resistance of wheat to the attacks of rusts.

In a preceding work devoted to the effects of manuring, the writer has shown that though fertilizers stimulate the cells of the plants and cause them to increase both in size and in number, with a simultaneous decrease in thickness of the walls, on the other hand they diminish the acidity of the cell sap; that is to say that the acidity of the cell sap in various plants which are unmanured, badly cultivated, or in the wild state, will always be greater than that in the corresponding organs of manured plants.

With the use of a nitrogenous fertilizer, not only is the size of the organs increased, but a considerable growth of parenchymatous and chlorophyll-containing tissues is obtained. This entails a high starch production and a consequent increase in reducing sugars which constitute its mobile form. But with the increase of reducing sugars in the sap, the amount of organic acids decreases, the different organs lose their acid taste (fruit, leaves etc.), and the gain in sugar is accompanied by a loss of hardiness.

It has further been ascertained that liquids containing sugar form the best media for the development of mycelia. Hence it follows that the organs of plants treated with nitrogenous fertilizers, being richer in sugar, are more liable to the attacks of parasitic fungi than the corresponding organs of plants which have not been manured, or have remained uncultivated. If therefore the susceptibility, and thereby the resistance, of an organ to a parasite varies according to the relative proportions of reducing sugars and acids present in the cell sap it follows that the bio-chemical factor (admitted but undetermined by investigators) which constitutes the means of resistance of an organ to disease may be estimated from the acidity of the cell sap.

The writer is convinced that this acidity is the factor which enables plants to resist parasitic fungi, and he states that if wild plants are not only more resistant to parasites, but also to injury and attack by physical agents, this circumstance is due rather to the greater acidity of their cell sap than to the greater density and compactness of their tissues. If the so-called hard wheats (*Triticum spelta*, *T. polonicum*, *T. durum*, *T. turgidum* and the races related to them) are more resistant than all the so-called soft wheats, this is due to the fact that the production of starch (and therefore of sugars) differs in the two groups: in the former, that of the hard wheats, where the caryopsis is rich in gluten and poor in starch, the sugar production is relatively less than in the case of soft wheats, which have a caryopsis poor in gluten and rich in starch. Therefore with the increase of starch in the grain the susceptibility of the latter to rust attacks should increase.

The power of the plants to produce sap more or less rich in sugars or in acid must be a specific character and therefore hereditary. Cultivation in general, and the application of manures in particular, exercises an improving influence on the plant, and the degree of improvement attained by the plant is largely controlled by the general conditions of cultivation to which it is subjected. Therefore, by means of domesticating it in different localities, one wild stock will produce different races, and their degree of susceptibility to disease will be intimately connected with the degree of improvement attained by each race in a given environment. And it will always be found that the organs of the plants which have been most improved are richer in sugars and poorer in acids than the corresponding parts of those whose improvement has not been carried so far.

Together with the acidity factor it has been recorded that a given race which is resistant in one region retains and frequently increases this characteristic when transfered to a colder region, whether the latter be more northerly or merely at a higher altitude, and *vice versa* loses its resistance in warmer regions. In this connection, it is sufficient to observe what occurs in the case of the vine. The acidity of the wine increases, and its sugar content, and consequently also its alcohol content, decrease gradually as the vineyards rise on the sides of the hills or spread into the more northern districts; and, *viceversa*, the acidity decreases and the sugar and alcohol content increase as the vineyards descend into more southern climes. Consequently a given variety which is resistant in cold or high regions will also lose this quality when brought into warmer localities, and according to the author, the variations in its power of resistance will always be correlated with its sugar and acid content.

The chemical analyses of American vines have confirmed the acidity principle advocated by the writer (1) so far as their resistance to phylloxera is concerned, and the same has been observed in the case of Rieti wheat, which is celebrated for its resistance to rust.

The first tests made at the Royal Station for Cereal Cultivation at Rieti proved that the sap of this variety was actually more acid than that of other kinds grown under similar conditions. Comparative tests were carried out at Rieti and in a much warmer locality (the plain of Apulia) which led to the following conclusions:

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(1) See in this connection *B.* Dec. 1910, p. 386. (*Ed.*).

a) In Rieti wheat the cell sap is more acid than that of other varieties of wheat grown under similar conditions in the districts of Rieti and Foggia.

b) The acidity of the cell sap, though maintaining almost the same order, decreases in all varieties grown in the plain of Apulia, *i. e.* in a warmer place than Rieti.

Taking these facts into consideration, the agriculturist should confine himself to biological means in order to increase the resistance of improved plants, *i. e.* to hybridisation and selection. By these means only can he discover the most resistant varieties for a given district. Further, in order not to diminish the plants' power of resistance to parasites, it is necessary to remember that the application of nitrogenous manures (especially dung), while being the most direct method of improving the crop by stimulating the development of parenchymatous tissues, at the same time increases the sugar content of the sap and thus renders the plants an easier prey to parasites. In order to preserve the highest degree of acidity in the cell sap and at the same time to maintain the fertility of the soil, nitrogenous manures should be avoided, and phosphatic fertilizers, especially superphosphates, should be used in their place.

MEANS OF PREVENTION AND CONTROL

882 - **Methods of Obtaining "Wetting" Fungicides** (1). — VERMOREL, V. and DANTONY, E. Sur les bouillies fongicides mouillantes. — *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, First Half-Year, Vol. 156, No. 19 (May 13, 1913), pp. 1475-1476. Paris, 1913.

The researches of the writers have proved that all cupric washes can be easily and economically rendered adherent, in the case of vines, by adding *a*) gelatine (3 to 8 oz. per 100 gallons) to acid washes, or *b*) an equal amount of casein, dissolved in milk of lime, in the case of washes with an alkaline reaction.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

883 - **Anthracnose of Sisal Hemp.** — SHAW, F. J. F. in *The Agricultural Journal of India*, Vol. VIII, Part I, pp. 66-68, plates XVI-XVIII. Calcutta-London, 1913.

The writer records that in various parts of India the leaves of *Agave rigida* var. *Sisalana* (the well known textile plant) have been extensively and seriously injured by a disease which he calls "Anthracnose of Sisal Hemp." According to investigations conducted on the spot, the disease is due to *Colletotrichum Agave*, described for the first time by Cavara in 1892, as occurring on the leaves of species of Agave in Lombardy.

Using infected material from Dacca, Mr. Shaw obtained pure cultures of the fungus and succeeded in reproducing the disease artificially. The *Colletotrichum* in question proved to be a wound parasite, and as it is not unusual to find longitudinal cracks in the leaves of Agaves, especially after a period of hot dry weather, it is easy to understand that infection might take place through such breaks in the superficial tissue.

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(1) See also No. 612 *B.* May 1913. (*Ed.*).

Collecting and burning diseased leaves and spraying with Bordeaux mixture are measures advocated by the writer for checking the disease.

884 - **Lime-Sulphur Wash for American Gooseberry Mildew *(Sphærotheca mors-uvæ)*.** — SALMON, E. S. and WRIGHT, C. W. B. in *The Journal of the Board of Agriculture*, Vol. XIX, No. 12, pp. 994-1004. London, 1913.

Different varieties of gooseberries differ to a marked degree as regards the susceptibility of the foliage to injury from the lime-sulphur wash. With some varieties, *e. g.* May Duke, it is possible to spray throughout the season with lime-sulphur sufficiently strong (1.01 sp. gr.) to prevent the attacks of American gooseberry mildew without causing any injury to the foliage; it is probable that, at least with some varieties, the young foliage will prove resistant to injury from the lime-sulphur wash at the beginning of the season (May) while showing susceptibility later in the year. This is of practical importance in controlling the disease, since it is also in May and the early part of June that spraying will prove most efficacious by preventing the first infection of the season due to the germinating ascospores and the subsequent rapid spread of the parasite by means of conidia.

Under ordinary summer weather conditions, the strength of the lime-sulphur wash should be as follows:

For Whinham's Industry, Rifleman, Warrington and May Duke: 1.01 sp. gr.

For Lancashire Lad: 1.005 sp. gr.

For Crown Bob: 1.005 sp. gr. used early in the season only, as later it may cause some injury.

For Berry's Early: 1.005 sp. gr. early in the season and when the bushes are more or less shaded; later in the season the wash damages the foliage even when used at lower concentrations.

Valentine's Seedling and Yellow Rough varieties show so marked a susceptibility to injury that the lime-sulphur wash should not be used on them at all. Until further experiments have been carried out the half-strength wash (1.005 sp. gr.) should be used and the spraying done on an experimental scale.

855 - **Fungus Diseases of *Hevea brasiliensis* and *Butyrospermum Parkii*.** — GRIFFON, ED. and MAUBLANC, A. Sur quelques champignons parasites des plantes. — *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 2, pp. 244-249, figs. 1-2, plates IV. Paris, 1913.

P. Hennings described and illustrated (1904) under the name *Dothidella Ulei* a fungus living on the leaves of *Hevea brasiliensis* (the rubber plant) collected in the upper valley of the Amazon. The writers have recently discovered the same species at the mouth of this river. On examining the material, they did not find the imperfect form described by Hennings under the name *Aposphaeria Ulei* and regarded by him as belonging to the cycle of development of *Dothidella*, an opinion which the writers do not share. They observed some stromae containing both asci (generally immature) and spermatia unlike those of *Aposphaeria* and finally found, on the lower surfaces of some leaves, a conidial form of the *Scolecotrichum* type which was without doubt connected with *Dothidella*. The investigators consider that the latter, in its different fruiting forms, may be a leaf parasite of *Hevea*, but not the cause of any serious disease. On adult trees the injury is practically negligible; plants in a nursery, such as formed the subjects of investigation, may, on the other hand, suffer considerably from the attacks of this cryptogam.

The writers then describe a disease which affects another useful tree, *Butyrospermum Parkii* (1), concerning the cryptogamic diseases of which there was, so far, apparently no information. They observed in the first place upon infected leaves gathered in the neighbourhood of Kulikoro (Upper Senegal and Niger), a fungus which they consider to be new and describe under the name of *Fusicladium Butyrospermi*. Finally, on a few leaves they discovered old and completely empty conceptacles (pycnidia or perithecia), and in addition to these the fructiferons organs of a *Pestalozzia*, which they describe as new (*P. heterospora*). The latter had apparently developed saprophytically on the patches produced by the first fungus. The writers have no information as to the conditions under which the two above-mentioned diseases were developed nor as to the injury (probably insignificant) which they caused.

886 - ***Asterina* sp. on the Leaves of Maté in Argentina.** — LENDNER, A. Un champignon epiphylle des feuilles d'*Ilex paraguariensis*. — *Bulletin de la Société botanique de Genève*, Second Series, Vol. II, No. 1, pp. 34-35, fig. 3. Geneva, 1913.

In the summer of 1912, the writer received from Rosario (Argentina) some leaves of Maté (*Ilex paraguariensis*) on both surfaces of which were black spots due to the presence of a superficial fungus; this was a species of *Asterina* (Perisporiaceae). It appears only here and there in the Maté plantations, but covers all the leaves of any tree which it attacks. On the lower surface of the leaf the fungus forms a somewhat regular black network, while on the upper side it appears under the form of black spots 1 to 2 mm. in diameter. The disease does not appear to harm the leaves, but its presence nevertheless detracts from the value of the product.

887 - ***Endothia pseudoradicalis* n. sp. on the Chestnut in Italy.** PETRI, L. Sopra una nuova specie di *Endothia, E. pseudoradicalis*. — *Rendiconti delle sedute della Reale Accademia dei Lincei. Classe di Scienze fisiche, matematiche e naturali*, 1913, Vol. XXII, First Half-year, Part 9, pp. 653-658, figs. Rome, 1913.

In the early part of 1912, at Torcigliano di Pescaglia (Lucca), the writer found at the base of some chestnut poles 5 or 6 years old numerous fructifications of an *Endothia* which he considers new, and of which he gives only a description for systematic purposes, naming it *E. pseudoradicalis*. The chestnut poles in question had sprung from the stump of a tree which had been felled in the hope of saving it from the ink disease.

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(1) For the uses and products of this plant, see No. 1296, *B*. Sept. 1912. (*Ed.*).

E. pseudoradicalis shows the closest affinity to *E. virginiana* And., but differs from the latter in the nature of the walls of the perithecium, which more closely resemble those of *E. parasitica* (Murr.) And.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

RASITIC
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888 – **Wintering of Dodder in the Vegetative State.** — MORETTINI, A. in *L'Italia Agricola*, Year L, No. 10, pp. 245-248, Plate. Piacenza, May 30, 1913.

Lazionow in one of his recent works (1) has stated that dodder (*Cuscuta*) is an annual plant; the opinion of other investigators is divided, some maintaining that it cannot survive the winter, while others doubt this assertion. On the other hand, investigations made in Italy by Benvenuti (1844) and Peglion (1909) showed that dodder in a vegetative condition can resist a winter temperature of 5° and 7° C. and grow luxuriantly on the return of spring.

The writer, who is conviced that the question is of great importance with regard to the means adopted for destroying the parasite, considered that in view of the uncertainty which prevailed on the subject, it would be useful to see how this plant behaved under the climatic conditions of Umbria.

The experiments were begun in the summer of 1912 in the experimental field of the Royal Institute of Experimental Agriculture at Perugia on a three-year-old field of lucerne in excellent condition of vegetation and from which all possibility of dodder infection by means of seed was excluded. The results (in March 1913) showed that, as had already been shown by Benvenuti and Peglion, this parasite is capable of wintering in a vegetative condition, *i. e.* can reproduce itself from year to year without necessarily forming seeds. This proof should suffice to convince farmers that if a crop is infected in the summer, unless measures are taken for the destruction of both the host-plant and the parasite, the latter will preserve its vitality throughout the succeeding winter and subsequently develop luxuriantly. Repressive measures carried out in winter are thus advisable in the case of summer and autumn invasion of the pest; these consist in cutting off the infected plants 1 to 3 cm. below the surface of the soil either with a spade or, better still, with a sharp hoe. All the cut plants should be burnt on the spot, or if removed elsewhere for destruction, this should be done with the greatest care. It is best to wait until February or the beginning of March before beginning the winter treatment, but it is necessary to carry it out before working the field in any way, and before the host-plants begin to show leaf, as the presence of young shoots makes it more difficult to distinguish the plants attacked by the dodder.

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(1) See No. 75, *B*. Jan. 1913. (*Ed.*).

889 - ***Senecio vernalis*, a Troublesome Weed in the Rhenish Palatinate.** — WÜST. Das Frühlingskreuzkraut (*Senecio vernalis*) in der Pfalz. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Part 5, pp. 70-71. Stuttgart, May 1913.

This groundsel made its appearance in the eastern provinces of Germany towards the beginning of last century — it was first observed in Silesia (1822) — and very soon spread to nearly all the German States. It has a vegetative period of two years, and as it passes the winter as a rosette is very difficult to eradicate from any spot where it has established itself.

It was recorded as occurring in the Palatinate as far back as 1906, where it made its appearance in the district of Ludwigshafen, whence it spread to a large part of the surrounding country. In 1908 it was found between Hassloch and Böhl growing in a field of lucerne.

Wherever it has not been kept in control by severe repressive measures, this weed has spread to such an extent that it has got quite out of hand, and it is no uncommon thing to see whole clover fields transformed into a sheet of yellow owing to the large numbers of plants present. It also invades the woods whenever it finds the conditions necessary for its existence.

The writer also maintains that, contrary to general belief, this weed is also to be feared in clover leys on arable land, since according to his investigations the seeds of *Senecio vernalis* retain their germinative power for some years. He therefore recommends the immediate adoption of repressive measures.

INSECT PESTS.

GENERALITIES

890 - **The Formation of a German Society of Applied Entomology.** — *Communicated to the International Institute of Agriculture.*

During the meeting of the German Zoological Society — which took place at Bremen from May 12 to 15, 1913 — at the initiative of Prof. K. Escherich of Tharandt (Saxony), a German Society of Applied Entomology ("Deutsche Gesellschaft für angewandte Entomologie") was formed. The object of this society is the formation of a suitable government organization for the purposes of scientific investigation, and of the control of insects which are economically harmful, or disease-carriers, and for dealing critically with the scientific material collected, and making known the practical importance of this subject.

891 - **On the Presence of *Icerya purchasi* and *Novius cardinalis* in the Maritime Alps** (1). — VUILLET, A. in *Bulletin de la Société entomologique de France*, 1913, No. 7, pp. 164-165. Paris, 1913.

In the summer of 1910, *Icerya purchasi* was introduced into an estate on the peninsula of Cap-Ferrat (Alpes Maritimes), whence within two years it spread greatly in the neighbourhood, especially on *Acacia, Kennedya, Pittosporum, Choisya* and *Citrus*. In the summer of 1912, *Novius cardinalis* was successfully reared and acclimatized; this ladybird is the principal natural enemy of the injurious scale insect in question.

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(1) See also No. 621, *B* May 1912. (*Ed.*)

At the present time, it is easy to find *Novius* in all stages of development in the zone invaded by *Icerya*.

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892 – *Cocobacillus cajae* n. sp., a Parasite of the Larvae of *Arctia caja* in France (1). — PICARD, F. and BLANC. G. R. Sur une septicémie bacillaire des chenilles d'*Arctia caja* L. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, First Half-year, Vol. 156, No. 17 (April 28, 1913), pp. 1334-1336. Paris, 1913.

The larvae of *Arctia caja*, which are numerous this year in the vineyards of the South of France, have fallen victims to two diseases: one, which has been known for some time, is due to *Empusa aulicae* Reich.; the other is of bacterial origin. The dead larvae become flaccid and exhale a nauseous odour; their alimentary canal is devoid of its usual contents and is only filled with a clear liquid, often free from any microorganism. In pure cultures, the blood contains a *Cocobacillus*, for which the writers propose the name of *C. cajae*, and by means of which they have artificially produced the disease. It is distinguished from *C. acridiorum* Hérelle by several biological and pathological characters (2). As the experiments made have shown the possibility of infection through the mouth, it is to be hoped that the new *Cocobacillus* may be of practical use.

893 – New Peruvian Parasites from *Hemichionaspis minor* (Hym.). — RUST, E. W. in *Entomological News*, Vol. XXIV, No. 4, pp. 160-165. Philadelphia, 1913.

A systematic description of *Prospaltella peruviana* n. sp., *Signiphora lutea* n. sp. and *Neosigniphora nigra* n. gen. et sp., parasites of the "piojo blanco" (*Hemichionaspis minor* Mask.), a scale infesting *Gossypium peruvianum* (native or tree cotton) in Peru.

894 – Experiments in the Control of Wireworms. — KAREL, M. Zur Drahtwurmbekämpfung. — *Fühling's Landwirtschaftliche Zeitung*, Year 62, Part 9, pp. 313-318. Stuttgart, May 1, 1913.

In 1912 a series of experiments was undertaken at the Dresden Agricultural Experiment Station on the control of wireworms (*Agriotes lineatus* larvae) which do a lot of harm to the crops every year. Of the numerous methods tried, only three can be recommendend for pratical purposes: *a*) placing in the ground half potatoes to serve as a bait for the larvae; *b*) repeated rolling of the ground; *c*) the use of nitrate of soda, nitrate of lime or kainit.

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(1) See also No. 761, *B*. June 1913. (*Ed.*).

(2) See No. 750, *B*. April 1913. (*Ed.*).

INSECTS INJURIOUS TO VARIOUS CROPS

895 – ***Aphis papaveris* Injurious to Beets in Northern France** (1). — MALAQUIN, A. and MOITIÉ, A. Le puceron de la betterave dans le Nord de la France. — *La Vie Agricole et Rurale*, Year 2, No. 24, pp. 696-699, 7 figs. Paris, May 17, 1913.

During the last few years, and especially in 1911, *Aphis papaveris* Fb. has appeared in large numbers in Northern France, where it has done much damage to the beets. The investigations made by the writers in that district confirm those of the Russian entomologist Mordwilko, who considers that *Aphis papaveris* of beets is the aphis found in spring on *Evonymus europaeus*, whence its name of *A. evonymi* Fb. This insect also lives on different species of *Rumex*, to which it owes its synonym *A. rumicis* L.

From the life cycle of this insect which is given briefly in the article, it appears that during the latter part of the autumn and throughout the winter and early spring, *i. e.* from October to the end of April, these aphides infest *Evonymus* and the females deposit on this plant the eggs which give rise to the founders of next season's generation. Owing to this circumstance preventive measures against the pest can be both offensive and defensive, as it is possible to kill the parasites on *Evonymus* and by destroying the winter eggs and the spring brood decrease the number of individuals which would otherwise swarm on wild or cultivated plants. In order to do this it would be well to eradicate entirely *Evonymus* in beet-growing districts; but in any case, it is indispensable that the insects infesting these shrubs should be destroyed in March, April and May and also, if necessary, in October.

The writers consider that preventive measures are preferable to remedies, such as spraying, which is only useful when the beets are already attacked and is besides a costly operation and only temporarily efficacious.

Further the assistance of some entophagous Hymentoptera may be requisitioned; this measure was adopted in 1912 with the result that over 50 per cent. of the aphides were destroyed, and the writers propose to continue their investigations in this direction.

896 – **A New Insect Pest on Roses: The Vine Curculio (Weevil) (*Orthorrhinus Kluggi* Sch.).** — FRENCH, C. Jun. in *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. XI, Part. 4, pp. 240-241, 1 fig. Melbourne, April 1913.

This insect, whose natural food is the wattle (acacia), is common in most parts of the State of Victoria. Of recent years it has done much injury to the vines, and in 1909 it was found on the terminal twigs of Jonathan apples and apricots while now its larvae begin to attack roses also and to cause the death of the stems. As these pests deposit their eggs on the exterior of vines and roses, the writer advises spraying the plants with a deterrent such as coal tar water, the formula for which is as follows: Boil 1 lb. of coal tar in 2 gallons of water, and while hot add from 50 to 100 gallons of water. Benzole emulsion might also be tried. All dead or dying acacias growing in close proximity to a garden should be destroyed by burning.

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(1) See also No. 2273, *B.* July 1911. (*Ed.*).

INJURIOUS VERTEBRATES.

INJURIOUS VERTEBRATES

897 - **Results of Experiments on the Control of Field Voles in France** (1). — *Feuille d'informations du Ministère de l'Agriculture,* Year 18, No. 16, p. 1. Paris, 1913.

For reasons which are not very clearly defined, the experiments with Danysz virus have given unequal and often insufficient results.

Another poison named "ratin", made in Paris by Dr. de Christmas, is being tested for the Ministry of Agriculture in Charente Inférieure (canton of La Jarrie), on an area of over 30 000 acres.

The Special Commission sent by the Ministry to examine on the spot the irregular action of this second remedy, although including it among the methods of controlling field voles, decided that until the cause of the uncertain action of this virus is scientifically determined, it cannot advise the general use of "ratin".

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(1) See No. 1567, *B.* Nov. 1912. (*Ed.*).

ALFREDO RUGGERI, gerente responsabile.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Various Methods of Farming in Spain

by

EMILIO LOPEZ SANCHEZ,

Professor of Rural Economy at the Special School of Agricultural Engineers.

This paper (within the limitats allowed by a periodical publication) will comprise the following points: grouping of the various Spanish provinces into large regions, and of the arable lands and "aprovechiamentos" (meadows, pastures and woods) into large groups in each of the provinces; prevailing form of land tenure; means of production used in large, medium and small farms.

The following illustration will forcedly give only the average general characters of each region, and in each of these the method of farming presents numerous special cases corresponding to certain local conditions, the description of which would be too lengthy to be mentioned here.

The division into agricultural regions, as well as the extent of arable land and of meadows, pastures and woods, corresponds to the official division established by the Ministerio del Fomento for the agricultural requirements of the country and to the statistics recently published by the General Direction of Agriculture.

The provinces included in each region are indicated, so that with the help of a map an idea may be formed of the distribution of the various methods of farming.

1st *Region: Central or New Castile.* — It comprises the provinces of Madrid, Toledo, Guadalajara and Cuenca. The distribution of productive lands is as follows:

Cereals	4 939 820 acres
Fruit trees, olives, vines and market gardens	1 131 109 »
Forests and pastures	5 559 481 »

It is thus seen that in this region the extent of arable lands is very nearly equal to that of forests and pastures. Grass leys are very much scattered and subdivided.

Great and medium estates generally prevail. There are many large properties called "dehesas"; some are wooded (pines, oaks, etc.); others are not, and their utilization consists in the renting of pastures within the limits set by the protection of the woods.

The large farms, as well as the olive groves and vineyards, are farmed by the owners themselves and are not rented. Small parcels of land at a distance from centres of population and the market gardens in some localities are rented; the lease lasts two to six years and the rent is generally paid in kind.

In this region the type of medium farms is met with also. The means of production corresponding to this degree of cultural intensity, expressed in percentages of the working capital as stated in a remarkable work (1) by Leopoldo Hernandez, civil engineer and manager of the Corunna Farm, are the following:

	Percentage of working capital
Furniture of owner and staff	4.70
Material and implements	17.79
Draught animals	44.88
Provisions	22.66
Circulating capital	9.97
Total	100.00

2nd Region: Mancha and Estremadura. — It comprises the provinces of Ciudad Real, Albacete, Caceres and Badajoz, the two first forming la Mancha and the two latter Estramadura. The distribution of acreage is as follows:

Cereals	5 158 889	acres
Fruit trees, vines, olives and market gardens	1 503 835	»
Forests and pastures	10 932 220	»

Wine and oil represent the most important crops in la Mancha. For vineyards occupy upwards of 250 000 acres in the province of Ciudad Real and of 150 000 in that of Albacete, while olive groves cover respectively 50 000 and 15 000 acres. Besides, the association of these two crops is equally important. Vineyards and olive groves extend also in to the Estremadura provinces.

In this region, as in the preceding one, the farms are usually managed by the owners themselves or their agents. Leasing is not much practised, while farming on the share system is more frequent.

In the dry lands under annual crops the owner must provide:

a) 75 per cent. of the seed; *b*) 50 per cent. of the cost of hoeing; *c*) the cost of the manure used.

The metayer must contribute: *a*) 25 per cent. of the land tax; *b*) three preliminary ploughings; *c*) the cost of sowing and half the cost of hoeing, the expenses for harvesting, gathering in the crops, threshing, cleaning and storing. One half of the crop belongs to the owner, the other half and the straw to the metayer.

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(1) *Rentabilidad del Trigo.* (*Authors' note*).

Olive groves are not rented; they are managed by the owner himself or his agent, or worked on the share system. In this case the owner contributes : *a*) 80 per cent. of the land tax, *b*) 50 per cent. of the expenses for pruning; the metayer's share is : *a*) 20 per cent. of the land-tax, *b*) three ploughings, *c*) the cost of pruning, if he takes all the wood, and the expense of picking and carting, *d*) 50 per cent. of the cost of guarding the grove, *e*) the cost of extracting the oil. The crop of olives is divided into equal parts between the owner and the metayer.

The vineyards are, like the olive groves, either managed by the owner himself or his agent, or worked on the share system, but never leased.

In Estremadura the lands called "dehesas" and covered with oaks are utilized by sending pigs on them to feed on the acorns.

Towards the middle of autumn when the pastures begin to be poor and the acorns on the evergreen oaks, which are earlier than those on the cork oaks, begin to ripen, the feeding begins. The animals are divided into two groups, of which one comprises the two and three year old pigs and the young ones, the other group the females and the one and two year old backward males. The feeding of the animals follows a certain order and is facilitated by knocking down the acorns with poles. Where this is done the "dehesa" is generally divided into four parts and the acorns are knocked down first in the lowest-lying part. The poles used have a stick attached to their upper end in such a way that it can move freely. The acorns are knocked down in the lowest quarter of the dehesa for about a fortnight, after which time the process is commenced in the second quarter for another fortnight and so on. The pigs themselves show when the moment for knocking down the acorns has come and the workmen engaged for this work must not commence it until the animals show their desire to have the acorns. In some localities the acorns are not knocked down and the pigs feed only on the acorns that fall naturally to the ground.

The amount to be paid for the acorns is settled in various ways; the most usual is to fix a certain sum for each arroba (25.36 lbs.) of gain in the live weight of the pigs, which are weighed at the beginning and at the end of the time that they feed on acorns.

The second group, as said above, consists of the sows and of the one and two year old backnuward males; these animals scatter all over the mountain and feed upon the acorns which fall from the trees, or which have been left on the ground by the preceding group.

3rd Region : *Old Castile.* — It includes the provinces of Valladolid, Burgos, Segovia, Avila and Soria. The distribution of productive lands is as follows :

Cereals	5 286 366
Fruit trees, olives, vines and market gardens	1 036 083
Forests and pastures	3 808 071

From the above it is seen that cereals are the prevailing crops.

The land is generally rented to the farmers. But of late years there is a tendency to replace the old traditional form, according to which the farmers handed down their farms from father to son, by short leases : from 6 to 8 years.

In other parts of the same region there is a tendency to form associations for mutual help : the poor peasants whose only means of production are their own hands and one draught animal join in couples so as to do their work better with two animals than with one, and this irrespective of the difference there may be in the land and in the animals; consequently there is no remuneration or compensation between the parties.

The agreements are generally private and only verbal, though of late here as well as in the other regions there is a tendency to make written private agreements and even before a notary public. The duration of these contracts is generally three or four years for yearly crops, and upwards of five for forest properties.

4th *Region*: *Aragon and Rioja.* — It includes the provinces of Saragossa, Huesca, Téruel and Logroño.

The productive land is distributed as follows :

Cereals	3 494 803
Fruit trees, vines, olives and market gardens	1 541 490
Forests and pastures	6 228 755

In this region permanent grass lands and grass leys have a certain importance, the extent of land devoted to these being at least 74 100 acres.

As a general rule the dry lands under cereals, olive trees and vines are managed directly by the owners or their agents, while the irrigated lands are let, under the name of " torres " to farmers called " torreros " who generally pay their rent in kind (wheat).

In certain regions and in the event of damage caused by the weather, such as frost, hail, floods or drought, it is the custom to diminish the rent proportionally to the extent of the damage done. The amount of this diminution is settled between the lessor and the lessee or by valuation by an expert.

The legal form of these contracts is fixed by local custom; their duration is usually one year, and they are tacitly renewed until one of the parties gives notice of their cessation.

5th Region: Leon. — It includes the provinces of Santander, Leon, Palencia, Zamora and Salamanca. The acreage devoted to the various crops is the following :

Cereals	6 123 446	acres
Vines	162 773	»
Other crops	92 877	»
Forests and pastures	5 915 877	»

In this region the province of Santander is the one which possesses the greatest extent of natural grass lands : about 1 235 000 acres.

In this province the properties are extremedy subdivided; the least usual form of farming is that on the share system, though it exists in some localities; in this case the owner provides the seed and takes one third of the crops, the farmer bearing all the other expenses of cultivation. If the owner provides manures as well as seeds then he gets one half of the produce.

The chief wealth of this province lies in its live stock. One of the methods of keeping cattle is the share system, according to which the owner gives the farmer one or more head of cattle for a certain time settled upon beforehand between them. The farmer engages to keep the cattle, getting in exchange: *a*) the whole quantity of the milk produced, *b*) one half the value of the calves, *c*) one half of the increase of value of the animals. This increase in value is based on the value of the animals agreed upon by the paties at the beginning of the contract. If on the contrary there is a diminution of value or death of the cattle, the loss is sustained in equal parts by both parties.

In the rest of the region large estates prevail and renting is prevalent; the rents are paid in kind (wheat); the agreements generally last five years and are for the most part renewable on the same conditions.

6th Region: *Galicia and Asturias.* — It is composed of the provinces Lugo, Orense, Pontevedra and Oviedo. Permanent grass lands are an important feature of this region, as may be seen from the following figures:

Cereals	1 991 605
Permanent grass lands	897 486
Fruit trees, olives, vines and market gardens	344 995
Forests and pastures	6 381 616

In this region landed properties are exceedingly subdivided and scattered, and the farms are rented without any limitation as to time; this system of leasing is called "foros" and "subforos"; nevertheless recently a tendency has arisen to limit the duration of these leases, generally to four years; when the time is not specified in the agreement, it is understood that it is to last all the time required to harvest the produce, even if it extends to two years or more, according to the rotation. The payment is most frequently effected in cash.

The following are data referred to a typical small farm of the region.

According to the agricultural engineer above-mentioned, for a farm divided as follows:

Wheat	3.46	acres
Meadows	1.16	»
Kitchen garden	1.10	»
Uncultivated land	4.44	»

the means of production corresponding to this degree of intensity of culture and represented by percentages of the working capital are the following:

House furniture	7.6	per	cent.
Material and implements	10 —	»	»
Draught animals	28.5	»	»
Productive animals	36.1	»	»
Provisions for the family	9.5	»	»
Circulating capital	8 —	»	»

7th Region : Navarre. — It comprises the provinces of Navarre, Alava, Vizcaria and Guipuzcoa. The productive lands are divided as follows:

Cereals	990 907
Grass leys	95 549
Fruit trees, vines, olives and kitchen gardens	85 536
Forests and pastures	3 084 190

In Guipuzcoa apple trees are cultivated to a great extent; their fruit is used for the preparation of a cider called in the country "sagardua"

In this region the small farms are worked by the owners themselves, the larger ones are rented or worked on the share system.

The social conditions are such that the agreements are almost always only verbal and rest on the good faith of the contracting parties. There are however exceptional cases in which the agreements are drawn up in writing with all the usual formalities. Generally no caution money is required, but lately a surety is asked for. The contracts last six years or an indefinite period, and at the end of the lease the farms must be returned to their owners in the same state in which they were consigned.

In cases of loss of harvest due to hail or other weather causes the rent is diminished by mutual understanding between the parties; the good faith on both sides is evidenced by the fact that the owner delivers into the farmers' hands breeding and productive live stock for him to keep and to utilize within certain limits, without the contract containing any clause contemplating a breach of trust on the part of the farmer.

8th Region: *Catalonia.* — It embraces the provinces of Barcelona, Tarragona, Lerida and Gerona. The productive lands are distributed as follows:

Cereals	1 654 958
Fruit trees, vines, olives and kitchen gardens	1 612 584
Forests and pastures	5 570 033

In this region the vineyards and olive groves are very important; the vineyards have been reconstituted on American stocks.

The share system prevails, not only in the farming of the land, but also in the keeping of live stock. The properties are not cultivated by the owners themselves except in the cases of very subdivided properties. The practice of renting the land is widespread but not so general as the share system, the duration of which varies from one year to an indefinite period, the custom being to give one year's notice.

In this region there exists a form of share system called "masoveria" which really partakes of the share system proper and of renting, because it entails payment of a sum in money besides dues in kinds; but what characterizes the system is the fact that the farmer or "masover" inhabits, in the house belonging to the property, certain rooms which are set apart for him (he being charged with the upkeep of the house and annexed buildings: cellar, granaries, etc) and takes the produce of the small kitchen garden usually attached to the house, as well as the fire wood that he requires.

As for the keeping of sheep on the share system, the owner and the farmer contribute equal shares for the purchase of the flock; if the pastures belonging to the property are insufficient, both parties contribute equally to the rent of the additional pastures; the salary of the shepherd is paid likewise by both, while his board is defrayed by the farmer; the cost of shearing is borne in equal shares by both partners, who divide also the profits or losses.

9th Region: Levante. — It includes the provinces of Valencia, Castellon, Alicante and Murcia. The productive lands are divided as follows:

Cereals	2 391 992
Fruit trees, vines and market gardens	1 788 499
Grass leys	201 428
Forests and pastures	3 243 503

In this region orange and fruit trees and market gardens are very important. The market gardens at Murcia occupy 26 600 acres, which are intensively cultivated; it is the same with the market gardens of Valencia and of Orthnela in the province of Alicante.

Direct management by the owner is limited to the small farms.

The prevailing systems are: leasing and the share system.

In the dry lands the duration of the lease averages 5 years, and the rent is usually paid in kind. These lands sown to cereals are called in the greater part of the region "white lands"; they are also worked on the share system and in this case the owner must: *a*) provide 75 per cent. of the seed; *b*) pay half the cost of hoeing and sometimes a part of the expenses of reaping according to a fixed rate per bushel of seed, and lastly he must pay for the manure.

The farmer must: *a*) pay 25 per cent. of the land tax; *b*) plough the soil three times in order to prepare it for the crop; *c*) defray the cost of sowing and one half the cost of hoeing, reaping, cartage, threshing, cleaning and carriage to the granary. The owner gets one half the grain as his share and the farmer the other half and the straw.

The irrigable lands are farmed in a variety of ways according to localities.

The olive groves are not usually leased; the same may be said of vineyards, which are farmed on the share system, usually for two years at a time.

10th Region: Eastern Andalusia — It is formed by the provinces of Grenada, Jaen, Malaga and Almeria. Its productive lands may be divided as follows:

Cereals	3 098 536 acres
Fruit trees, vines, olives and market gardens	1 443 293 »
Grass leys	621 205 »
Pastures and uncultivated lands	459 647 »

11th Region: Western Andalusia. — It includes the provinces of Seville Cadiz, Cordova and Huelva. Its productive lands are divided as follows:

Cereals	3 968 542 acres
Fruits trees, vines, olives and market gardens	1 410 247 »
Grass leys	1 295 873 »
Pastures and uncultivated lands	4 937 505 »

These two regions may be considered together, as their systems of farming are the same.

The cultivation of the olive tree is very important in both of them.

Great estates are prevalent, and they are generally managed by the owner himself or his agents; nevertheless the practice of leasing the land has of late been gradually extending. The lease is generally a six years' one; sometimes a mortgage guarantee is required, or a personal guarantee with or without surety.

The least widely spread form of farming is that on the share system; there are however cases in which two farmers engage in a metayer agreement to farm an estate which they hold under the usual rent conditions. The agreements are generally made by a public notary.

As has already been said, large estates prevail in this region, and according to the engineer already mentioned, the working capital of a property of 2650 acres may be divided as follows:

Furniture	7.51 per cent.
Material and implements	19.56 »
Live stock	44.72 »
Provisions	13.20 »
Circulating capital	15.01 «
	100.00

The 12th and 13th regions comprise the Balearic and the Canary Isles; they are not described here, not being in the peninsula.

The Study of Colonial Agriculture in Italy

by

DR. GINO BARTOLOMMEI GIOLI,

Director of the Italian Colonial Agricultural Institute, Florence.

Interest in colonial agricultural problems has only quite recently been aroused in Italy among the general public and the studious classes. It may be said that up to within a few years ago the study of colonial agriculture was almost completely neglected in this country and that during the last five years it has received a powerful stimulus from the propaganda exerted in its favour by a few students of the subject and still more from the necessity felt by the country of a better knowledge of its growing colonial possessions and of the means of utilizing them better. The conquest of Lybia succeeded better than the Eritrean and Somali colonies in causing agricultural research in the colonies to be held in higher consideration and in bringing into prominence the few institutions which already for some years had devoted themselves to this study. And if it is useful to inform the public of the best work done in this branch of scientific and technical activity, it is not without interest to recall the beginnings of this salutary and promising awakening, all the more so as these also belong to the near past.

So long as the occupation of Eritrea was limited to the coast, there was no inducement to take up the study of the agricultural problems of that colony owing to the limited extent of the conquered territory and to its low natural wealth. Thus the first step in the direction of colonial agricultural study dates back only to 1891, in which year, after the occupation of the Eritrean plateau, the Royal Decree of January 25 instituted a Colonization Office under the Councillor for Agriculture. Then at Asmara an Agricultural Experiment Station was founded, as a basis for colonizing the temperate districts of the Colony (1).

But the political events of 1895 and 1896 stopped the experimental work that had so auspiciously begun, and prevented the government for several years from resuming the agricultural study of the colony in its temperate districts and from extending it to the torrid and semi-torrid zones. Thus it was not until 1901 that the interrupted work was taken up again, when the Government of Eritrea entrusted an agricultural expert with the task of reporting upon the agricultural possibilities of the most important districts of the colony and of drawing up plans for a regular agricultural experiment service. The Report (1), after having described the various agricultural regions which make up the colony, the conditions of native agriculture and the natural resources of the country, proceeded to examine the crops and the live stock that might be raised with probability of success and lastly proposed the establishment of an agricultural experiment station in the Colony. The Report further expressed the wish that in Italy centres of cultivation and of study should be established with the objects of keeping in close touch with the Agricultural Bureau, of preparing the experts necessary to exploit the Colony and of calling the attention of the public to colonial agricultural problems in general. At the same time, in the year 1901 the first experiments on tobacco and cotton growing were made in Eritrea, the latter proving very satisfactory (2).

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(1) Reports of Baron LEOPOLD FRANCHETTI, Member of the Italian Chamber of Deputies on the work of the Bureau of Agriculture and Colonization of Erytrea, presented by the Minister of Foreign Affairs in the sittings of March 3, 1893, and April 28, 1894.

The Colonial Government approved the proposed Agricultural Experiment Bureau, which was founded in 1902, and in 1909 was incorporated in the Colonization Bureau. The activity of the agricultural experiment service has not been hitherto very marked; nevertheless the first results of its experiments with exotic plants, and a more accurate study of some regions, have enriched our agricultural literature by some valuable volumes (3) whilst the collections of vegetable products, both spontaneous and cultivated, and of the products of animal husbandry prepared by that Bureau for the exhibitions of Florence, Ravenna, Asmara, Milan, and Turin, and carefully illustrated by well arranged catalogues (4), showed in their real light the agricultural possibilities of Eritrea.

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(1) Dr. GINO BARTOLOMMEI GIOLI. *L'Agricoltura nell'Eritrea.* Report to the Royal Special Civil Commissioner. Later republished in the *Bollettino dell'Emigrazione*, No. 16, Year 1906, under the title : *Agricoltura e Colonizzazione nell'Eritrea.* On the same subject : G. B. GIOLI. Le attitudini della Colonia Eritrea all'agricoltura. — *Atti della R. Accademia dei Georgofili* 1912. Dr. G. B. GIOLI. La colonizzazione agricola dell'Eritrea. — *Atti R. Accademia dei Georgofili*, 1903.

(2) AURELIO PAOLETTI. *Resultati degli esperimenti di cotonicoltura eseguiti nel* 1901-02, attached to the *Relazione su la Colonia Eritrea del R. Commissario Civile Straordinario* (years 1900-01).

(3) BALDRATI, I. *La coltivazione del sesamo nella Colonia Eritrea.* From the *Rivista Coloniale*, 1906, p. 8.

BALDRATI, I. *L'arachide.* Abstract from *Agricoltura Coloniale*, 1907.

BALDRATI, I. *L'Agave sisalana.* From *Agricoltura Coloniale* 1907.

BALDRATI, I. *Le piante tessili della Colonia Eritrea.* From *Almanacco dell'Italia Agricola*, p. 11.

BALDRATI, I. *Le condizioni agricole della valle del Barca. Biblioteca Agraria Coloniale*, No. 4. Edizioni dell'Istituto agricolo coloniale italiano, Firenze.

(4) BALDRATI, I. *Catalogo illustrativo della Mostra agricola dell'Esposizione Orto-avicola di Firenze, anno* 1903. Appendici : *Indice della mostra xilologica del R. Istituto Botanico di Roma.*

BALDRATI, I. *Catalogo illustrativo della Mostra Eritrea nella Esposizione Internazionale di Milano*, 1906.

Besides the work of the Agricultural Experiment Bureau, special researches on questions concerning live stock and forestry (1) must be mentioned, as well as the solutions given to some technical problems by local agricultural undertakings, such as cotton plantations (2).

There is no doubt that the agrological study of Eritrea, to which geologists, botanists, hydraulic engineers, economists (3) and jurists have contributed, has not only aroused the interest of the public in such researches, but has also favoured the formation of a nucleus of experts in colonial agriculture.

Italian Somaliland, though from the political point of view more fortunate than the older colony, may be said to have been opened up to agricultural investigations only during the last few years; during the first period of our effective occupation the modest Agricultural Bureau which had been installed there, was not in a position — for several reasons — to do the work for which it had been founded, and had to confine itself to a summary study of the limited extent of territory then accessible to investigations (4). But later, in 1910, when the extent of territory occupied had increased and the inhabitants had been pacified, the present government replaced the experimental agricultural service by an Advisory Bureau for agricultural undertakings, from which the experimental service depends. And notwithstanding the fact that the Advisory Bureau has only been a few years in existence, the work which it has accomplished, as it appears from some important reports (5), promises useful results; it follows a plan of action based on the same lines as those adopted by the neighbouring English and German colonies, but aiming at the same time at giving agricultural colonization in Somaliland a special character corresponding to the climatic and hydrological conditions of the country and to our particular ethnological and economic tendencies.

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(1) Marchi, Ezio. *Studi sulla Pastorizia della Colonia Eritrea. Biblioteca Agraria Coloniale,* No. 1. Ediz. dell'Istituto Agr. Col. Ital. 1910.

Fiori, Adriano. *Boschi e piante legnose dell'Eritrea. Biblioteca Agraria Coloniale,* No. 7. Ediz. dell'Ist. Agr. Col. Ital. 1912.

(2) Società per la Coltivazione del cotone nella Colonia Eritrea, *Cosa si è fatto nei primi quattro anni.* Gino Lavelli De' Capitani, relatore, 1909.

(3) The following publications are worthy of special mention :

Nicola Coletta, C. E.: *Sull'utilizzazione a scopo d'irrigazione delle acque del fiume Gasc nella Colonia Eritrea.*

Giotto Dainelli and Olinto Marinelli: *Resultati scientifici di un viaggio nella Colonia Eritrea.* R. Istituto di Studi Superiori Pratici e di Perfezionamento di Firenze, 1912.

L'*Eritrea Economica*: a cura della Società di Studi Geografici e Coloniali di Firenze, Edizione dell'Istituto geografico De Agostini, Novara, 1913.

Odoardo Beccari: *Le Palme del genere "Raphia",. Biblioteca Agraria Coloniale* No 2. Edizione dell'Istituto Coloniale Italiano 1910.

(4) Cesare Maccaluso. L'agricoltura nella Somalia Italiana meridionale (Benadir) in *Bollettino Ministero Affari Esteri,* Anno 1908. Rome, 1908.

(5) Romolo Onor. Allegati alle Relazioni del governatore della Somalia Italiana presentati negli anni 1910 e 1912.

The researches of scientists and of technical experts in geology, hydrology, hydraulics and natural science that have already appeared (1), and those that will be published (2), support and complete the work of the Advisory Bureau, as the juridical study of the tenure of land will supply the basis for the regular preparation of agricultural colonization.

It will be well now to refer briefly to the work begun by Italians to illustrate the physical, agricultural and economic conditions of Libya, and to examine what results are likely to be attained by agricultural undertakings. Many works of compilation have recently been published with the object of showing the agricultural and economic value of the colony, but hitherto only a few are original and the result of serious research carried out on the spot by experts. Among these the Report (3) of the Agrological Mission sent to Tripoli last year by the Ministry of Agriculture, Industry and Commerce is worthy of special mention. This report is the most complete contribution to the study of the Tripoli district from the agricultural point of view as well as from the botanical, hydrogeological and zootechnic. This classical work leads us to expert equally good results from two other agrological missions sent in February of this year to Tripoli in order to continue the studies and researches. Of these two missions one is official (4); the other is sent with a similar object by the Italian Association for the study of Libya (5).

Within a few months Cyrenaica will be open to research and the rich harvest of data collected in a praiseworthy work of a correspondent of the Istituto Agricolo Coloniale Italiano at Bengasi (6) is a guarantee of the importance and novelty of the agricultural problems which that rich province offers to the studious.

Much less important than the above mentioned are the contributions by our investigators to the solution of the agricultural problems of foreign countries. And while our emigration beyond the limits of Europe had already, towards the end of last century, succeeded in creating strong and flourishing colonies abroad it had not promoted among the governing classes of the mother country any decided inclination towards those problems that the people so bravely faced and often successfully solved.

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(1) Guido Mangano and G. Rossi, *Studio analitico di alcuni terreni della Somalia Italiana meridionale.* Edizioni Istituto Agricolo Coloniale Italiano, 1909.

II° Congresso degli Italiani all'Estero, Roma, 1911. Sezione VIII. Relazioni varie.

(2) The results of agricultural enquiries carried out during 1911-12 by Drs. G. Scassellati and N. Mazzocchi are now in the press.

A mission composed of Professors G. Stefanini and G. Paoli is at present in the colony engaged in a study of the country from the point of view of the naturalist and the hydro-geologist.

(3) Ministero di Agricoltura. *Ricerche e studi agrologici su la Libia. - La zona di Tripoli.* Relatori De Cillis, Franchi, Trotter e Tucci.

(4) Members of the Commission are the following Professors: Parona, Cavara, Coletti, Creama, De Cillis, Di Tella, Drago, Eredia, Franchi, Odifredi, Peglion, Simonetti, Trotter, Tucci, Valenti. Secretary: Mazzocchi.

(5) The mission under the leadership of Senator Baron Leopold Franchetti is composed of Professors Gugnoni, Manetti, Pampanini, Pucci and Stella.

(6) Carlo Manetti. *Appunti di Agricoltura Bengasina.* Ministero degli Affari Esteri, Ufficio di Studi Coloniali, No. 22, Novembre 1912.

The character of our emigration, chiefly proletarian, its extent, and the difficulties attendant upon the technical and scientific study of distant foreign countries, did not induce Italian students to devote themselves to agricultural colonial questions ; they have only lately received an efficient stimulus to face these problems when a better understanding of the task to be accomplished by our colonies has given a more solid basis to our interest in them.

It is thus to this last period that some important studies made by Italian agronomists on North and South America, on Australia and on some parts of Africa belong. These works are mainly intended as material for the preparation of plans of colonization, but sometimes they are the result of investigations that have no exclusively speculative object (1).

After this brief review of the work done by our students in the field of agricultural research in the colonies, it will be well to see what has been done in the mother country to promote and organize this new order of investigations with the object of providing agricultural colonization with the indispensable technical knowledge

In the domain of botany applied to colonial requirements two institutions are of especial assistance for colonial investigations, namely the Royal Colonial Garden at Palermo and the Royal Colonial Museum and Herbarium in Rome, both of which are annexed to the respective Botanical Institutes.

The latter was the first Institute of colonial scientific character founded in Italy (1904). Its objects are : to collect in the colonies belonging to Italy, specimens of the flora and of the useful and utilizable plant products connected with them The institute further studies these collections (2) in order to acquire a more complete knowledge of the resources of that flora ; the usefulness of this work will be easily understood and is further shown by the many botanical publications and some agricultural ones issued by the Institute (3).

The Royal Botanic and Colonial Garden at Palermo aims chiefly at introducing, cultivating, improving and spreading those plants which possess economic or industrial importance for Sicily or for our African colonies. It began to work regularly in 1907 when its buildings and grounds were enlarged. Some investigations on rubber plants were completed, the possibility of cultivating *Agave sisalana* in Sicily was ascertained, and other exotic plants were spread. The study on cotton was resumed and new hybrids were made and tried in Sicily. Numerous reports, monographs and investigations bearing more or less upon colonial subjects and published in the organ of the Royal Botanic and Colonial Garden and other periodicals (1) bear witness to the activity of the institution. In order to place this garden in a position to meet the most recent requirements of the task of utilizing our colonies, a Bill has been presented to Parliament with the object of ensuring its existence and of voting the necessary funds for its more practical and efficient action.

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(1) In this connection see : *Bollettino dell'Emigrazione*, published by the Commissariato dell'Emigrazione, *L'Agricoltura coloniale* of the Istituto Coloniale Italiano of Florence, *La Rivista Coloniale*, organ of the Istituto Coloniale Italiano of Rome, and several agricultural periodicals of the Kingdom.

(2) The activity of the Institute is shown by the numerous publications, mostly of botanical character, which have appeared in the Annals of the same Institute and in several other botanical periodicals.

(3) See the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs, and other periodicals.

Lastly, the only Italian colonial institution of a purely agricultural character will be mentioned. In founding it, its promoters contemplated filling up a gap in our educational institutions, which was the principal cause of our want of preparation for the work of exploiting our new colonies. In 1904 the preliminary work was begun for the foundation of an important Italian colonial agricultural institution having the following aims : to act as a centre of information, advice and propaganda for all matters dealing with the agriculture, animal husbandry and natural resources of the political and other colonies, to prepare the higher and subaltern staff for colonial agricultural and live stock farms ; to complete the Government agricultural experiment work in our territorial colonies; to introduce into Italy new practical systems of farming and of live stock raising as well as plants and animals from extra-European countries ; to study improved methods of farming and of breeding that had already been introduced into Italy, but had not yet been sufficiently experimented ; lastly to get into touch with foreign institutions for the exchange of material and of information. A part of this extensive programme was carried into practice in 1906, and in 1908 the Italian Colonial Agricultural Institute was in full working order. To day every one of its branches is accomplishing an ever increasing amount of work, thanks to the financial help of Government and local bodies and the support of other Florentine institutions (2). It possesses abundant demonstration material collected in its museum of agricultural produce, and is provided with a library, laboratories, hothouses, and a staff that has been well trained for its work by much study and by travel in the colonies. Five years ago the theoretical-practical school of colonial agriculture for the young men who have been through the practical schools of agriculture or the agricultural section of the Royal technical institutes, was opened and most of its licentiates have found satisfactory employment in farms belonging to private persons or to companies or in government offices in Eritrea, Somaliland, British Africa, Nyasaland, Malacca, Argentina, Brazil, Texas, Montenegro, etc. But the educational function of the Institute is becoming gradually more complete by the addition of higher courses. Thus last year a course of colonial veterinary pathology was instituted for doctors in veterinary science, and the results were most encouraging. This year a higher course of colonial agriculture will be added for men holding a doctor's degree of the Royal higher schools of agriculture and will be chiefly devoted to our African colonies, while separate lectures or series of them will continue, to be held on various subjects and on the agricultural conditions of those countries beyond the seas to which our emigration flows.

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(1) See *Bollettino del R. Orto Botanico e Giardino Coloniale di Palermo* and the publications of the Bureau of Colonial Studies of the Ministry of Foreign Affairs.

(2) Among these the following deserve special mention: The Royal Botanic Institute, the Royal School of Pomology and Horticulture, and the Royal Station of Agricultural Entomology.

Besides the above educational work the Institute has published for the last seven years the *Agricoltura Coloniale* and a series of colonial agricultural works, of which already eight volumes have appeared (1).

It publishes also reports and colonial agricultural monographs and by means of its agricultural experimental service it furnishes plants, new seeds and breeding animals, and gives advice and information. It possesses also a library, a chemical and technological laboratory, hothouses and land for experiments.

The Institute has prepared several missions for the agricultural study of some colonial districts and has drawn up programmes for missions; among the latter the plan for a mission intended to study Libya (2) from an agricultural point of view, and which was presented to the Ministry of Foreign Affairs in the autumn of 1911, is to be mentioned, whilst among the former it is worthy of note that the Institute has supplied technical and scientific experts for exploitations in British and German East Africa, British India, Java, Italian Somaliland, Eritrea, Libya and Angola. Nor must it be forgotten that the Ministry of Agriculture, Industry and Commerce commissioned the Board of the Institute to represent Italy at the International Congress of Tropical Agriculture at Brussels in 1910 (3) and that the Institute works in close connection with other kindred Italian institutions in the field of agricultural investigations.

From the above summary it will be seen that the Institute is at present the centre best adapted to promote the study of colonial agriculture in Italy and the one which has made the greatest number of scientific and practical contributions during the last five years to the study of colonial agriculture.

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(1) Besides the works previously mentioned there are the following:

OBERTO MANETTI. *Istruzioni per la raccolta d'informazioni e di prodotti agrari nei paesi extra europei*. No. 3.

ISAIA BALDRATI. *Le condizioni agricole della valle del Barca*. No. 4.

ZIMMERMANN MORESCHINI, *Istruzioni per la coltura del cotone nell'Africa*. No. 5.

MANETTI, OBERTO, *Le colture aride, " Dry Farming "*. No. 6.

W. LA BAUME, and A. MORESCHINI, *Le cavallette africane*. No. 8.

(2) *Progetto di Missione di Studio in Libia*. Relazione a S. E. il Ministro degli Affari Esteri del direttore dell'Ist. Agr. Col. Ital.

GINO BARTOLOMMEI GIOLI, Ufficio di Studi Coloniali, No. 14. July 1912.

(3) GUIDO MANGANO. *L'opera del Comitato per la partecipazione dell'Italia al 2° Congresso Internazionale di Agronomia Tropicale*. — Brussels 1910 - Relazione a S. E. il Ministro di Agricoltura, Industria e Commercio.

Want of space does not allow us to mention other secondary, but promising, symptoms of the reawakening in Italy of interest in the study of colonial agriculture, because they manifest themselves in so many ways that they cannot be succinctly described. The daily press, the technical and scientific periodicals, as well as congresses, academies, laboratories, colonial, geographical and speculative institutions (1), all devote a part of their activity to agricultural and colonial questions and draw the attention of the public to technical problems which it had not been in the habit of considering.

Viticulture in Hungary

by

Dr. François de Lónyay,

Ministerial Consellor, Chief of the Viticultural Section of the Royal Hungarian Ministry of Agriculture.

When the Hungarians, on coming from Asia, took possession in the ninth century of the present country of Hungary, they found vine-growing prosperous there, this industry having been introduced in the third century by the Emperor Marcus Aurelius Probus into the Roman Province of Pannonia. Although on first occupying Hungary the Hungarians led a somewhat nomadic life, there were amongst them, already in the tenth century, numerous vine-growers and agriculturists. Béla IV, king of Hungary, founded in the thirteenth century, in the neighbourhood of Tokay, colonies of Italian vine-growers ; these imported from the district of Formia, cuttings of the " formint " vine, which received the name of their city and afterwards became the parent-variety of the celebrated Tokay wine.

The conditions of soil and climate obtaining in Hungary are most favourable to viticulture, which became increasingly prosperous both in the various mountain districts, and on the plains and sandy hills.

Unfortunately, phylloxera in spreading rapidly over all the neighbouring countries of Europe, did not spare Hungary. Its first appearance was recorded in 1875 in the southern districts of the country, notably at Pancsova, and in spite of energetic measures (the uprooting of the infested vines) it proved impossible to eradicate the pest. From 1880 the ravages of this insect extended to other districts.

According to the data of the survey made on the appearance of phylloxera, vines then occupied 1 050 978 acres, of which 884 371 acres were in Hungary proper, and 166 606 acres in Croatia-Slavonia.

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(1) Reale Accademia dei Georgofili, Florence. — Istituto Italiano per l'Espansione Coloniale e Commerciale, Venice. — Istituto per gli Scambi Internazionali, Genoa. — Società Africana d'Italia, Naples. — Istituto Coloniale Italiano, Rome.

INSTITUT INTERNATIONAL D'AGRICULTURE

Bulletin mensuel des Renseignements Agricoles et des Maladies des Plantes

Année IV, No 8. Rome, Août 1913.

La I^{ère} Partie renferme 6 *Aperçus originaux*, à savoir : 1. Les divers modes d'exploitation agricole en Espagne. par M. E. Lopez-Sanchez, Professeur d'Economie rurale à l'Ecole spéciale des Ingénieurs-Agronomes de Madrid — 2. Les études d'agriculture coloniale en Italie, par M. Gino Bartolommei-Gioli, Directeur de l'Institut agricole colonial à Florence — 4. La Viticulture en Hongrie, par M. le Dr. F. de Lónyay, Chef de la Section de Viticulture au Ministère royal hongrois de l'Agriculture — 5. La Reproduction consanguine dans l'Elevage en Allemagne ; état actuel de la question, par M. H. Kraemer, professeur à l'Ecole Supérieure d'Agriture de Hohenheim — 6. L'utilisation du Lait écrémé dans l'alimentation des Veaux, par M. le prof. Antonio Pirocchi, Directeur de l'Insritut Zootechnique de l'Ecole Supérieure d'Agriculture de Milan.

Dans la II^{e} Partie : *Articles Analysés*, on trouvera: Une série de Mesures législatives et administratives concernant l'Agriculture; 2 articles sur le Développement agricole, en Russie et en Hollande ; une liste d'Expositions, Concours et Congrès agricoles. — On peut relever, comme particulièrement intéressants, des articles concernant : Les Traitements cupriques et la Nitrification du sol. — Expériences d'irrigation avec Eaux Saumâtres en Italie. — L'utilisation des Phosphates minéraux en Russie. — Les Engrais radio-actifs — La pénétration de l'Azote, sous diverses formes, chez les Plantes — La Fumure de la Canne à sucre. — La Betterave sucrière en Argentine. — Action de la Fleur de soufre sur les Betteraves sucrières. — L'industrie horticole à Gand, Belgique. — Les Bananiers : Culture, Exploitation, Commerce, etc. — La lutte contre les Mouches. — La Sériciculture dans les pays tropicaux. — Une série d'articles étudient des questions de Zootechnie. de Génie Rural, d'Economie rurale et d'Industries agricoles.

La section consacrée aux *Maladies des plantes* renferme entre autres : Mesures législatives prises en Italie pour prévenir et combattre les Maladies des Plantes. — Ordonnance concernant l'importation des Pommes de terre dans l'Australie occidentale. — Organisation du Service phytopathologique au Japon. — La Vitalité des Graines de Plantes nuisibles. — Une séries d'articles consacrés aux Insectes et autres Invertébrés nuisibles aux diverses plantes.

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La Ière Partie renferme 6 *Aperçus originaux*, à savoir : 1. Les divers modes d'exploitation agricole en Espagne. par M. E. Lopez-Sanchez, Professeur d'Economie rurale à l'Ecole spéciale des Ingénieurs-Agronomes de Madrid — 2. Les études d'agriculture coloniale en Italie, par M. Gino Bartolommei-Gioli, Directeur de l'Institut agricole colonial à Florence — 4. La Viticulture en Hongrie, par M. le Dr. F. de Lónyay, Chef de la Section de Viticulture au Ministère royal hongrois de l'Agriculture — 5. La Reproduction consanguine dans l'Elevage en Allemagne; état actuel de la question, par M. H. Kraemer, professeur à l'Ecole Supérieure d'Agriture de Hohenheim — 6. L'utilisation du Lait écrémé dans l'alimentation des Veaux, par M. le prof. Antonio Pirocchi, Directeur de l'Insritut Zootechnique de l'Ecole Supérieure d'Agriculture de Milan.

Dans la IIe Partie : *Articles Analysés*, on trouvera: Une série de Mesures législatives et administratives concernant l'Agriculture; 2 articles sur le Développement agricole, en Russie et en Hollande ; une liste d'Expositions, Concours et Congrès agricoles. — On peut relever, comme particulièrement intéressants, des articles concernant : Les Traitements cupriques et la Nitrification du sol. — Expériences d'irrigation avec Eaux Saumâtres en Italie. — L'utilisation des Phosphates minéraux en Russie. — Les Engrais radio-actifs — La pénétration de l'Azote, sous diverses formes, chez les Plantes — La Fumure de la Canne à sucre. — La Betterave sucrière en Argentine. — Action de la Fleur de soufre sur les Betteraves sucrières. — L'industrie horticole à Gand, Belgique. — Les Bananiers : Culture, Exploitation, Commerce, etc. — La lutte contre les Mouches. — La Sériciculture dans les pays tropicaux. — Une série d'articles étudient des questions de Zootechnie. de Génie Rural, d'Economie rurale et d'Industries agricoles.

La section consacrée aux *Maladies des plantes* renferme entre autres : Mesures législatives prises en Italie pour prévenir et combattre les Maladies des Plantes. — Ordonnance concernant l'importation des Pommes de terre dans l'Australie occidentale. — Organisation du Service phytopathologique au Japon. — La Vitalité des Graines de Plantes nuisibles. — Une séries d'articles consacrés aux Insectes et autres Invertébrés nuisibles aux diverses plantes.

Communiqué à la presse.

In 1884, the area under vines increased to 1 076 446 acres, which proves that at that date more vines had been planted than had been destroyed by phylloxera ; but since 1885 the number of newly planted vines no longer compensated for those destroyed by the parasite. In 1895 the vineyard area had decreased to 606 150 acres. Since the latter date, however, the reconstitution of the vineyards which had been destroyed and the planting of vines in the sandy districts has received a fresh impetus, and in 1911 the area under vines in Hungary was 883 924 acres.

The following figures give the total vineyard area according to the annual returns and the amount of wine produced in Hungary.

Year	Area in acres			Wine production in gallons		
	Hungary proper	Croatia Slavonia	Hungary State	Hungary proper	Croatia Slavonia	Hungary State
1885	908 103	168 101	1 076 204	132 554 246	29 257 800	161 812 046
1890	768 466	133 079	901 545	83 383 175	8 142 068	91 525 918
1892	614 588	140 308	754 921	19 471 474	4 566 650	min 24 038 124
1895	501 077	105 074	606 150	47 152 556	6 413 616	53 566 172
1898	514 938	98 173	613 111	27 820 188	4 083 904	31 904 082
1900	547 939	94 816	642 756	40 135 964	7 351 740	47 487 704
1905	636 719	105 691	742 410	77 424 468	16 311 416	93 735 884
1908	715 344	98 380	813 724	159 170 286	36 872 616	max 196 042 902
1910	753 725	111 049	864 774	62 143 730	5 442 514	67 586 244
1911	770 778	113 146	883 924	101 549 668	19 177 730	120 727 198

In Hungary proper the area of vineyards, in 1911, was divided as follows :

a) Vines grafted on American stocks resistant to phylloxera . . .	259 350 acres
b) Vines treated with carbon disulphide	99 889 »
c) Other vines in compact soil	94 317 »
d) Vines planted in sandy soils	317 222 »
Total . . .	770 778 acres

The figures relating to these categories in Croatia-Slavonia are not yet known. On account of the ravages of phylloxera and mildew, the annual wine production of the State of Hungary varied from 1891 to 1900, between 24 038 124 and 53 566 172 gallons. Nevertheless, since the beginning of the twentieth century, the work of the reconstitution of the vineyards which had been destroyed and the plantation of new ones has developed uninterruptedly, so that in spite of frequent misfortunes, Hungary produced between 1907 and 1911 an annual average of 116 738 600 gallons of must, of which 95 622 714 came from Hungary proper and 21 115 886 from Croatia-Slavonia.

From the time of the phylloxera invasion, the Hungarian Government has frequently sent experts to study the control measures adopted in France and has lost no time in taking energitic measures which assured, and still continue to assure, to our vine-growers efficacious and valuable assistance.

In order to destroy the first centres of infection, the State paid compensation to the owners for all the vines which were up-rooted. This measure had not, however, the desired results. At the present day, the control methods most employed in Hungary are ;

1. Planting vines grafted on phylloxera-resistant American stocks.

2. Treating the vines annually with carbon disulphide.

3. Planting on sandy soil where phylloxera cannot exist. Such soil occupies vast areas in Hungary. These three measures were adopted with the efficacious assistance of the Government. At first, American direct bearers were also used, and the submergence of the infected vineyards was practised, but at the present time both these expedients have been abandoned. In Hungary, American direct bearers are not in favour; further, their resistance is doubtful, while as the vineyards most attacked by phylloxera are situated on the mountain slopes, their flooding is an impossibility.

In order to preserve the old vineyards which have been infested by phylloxera, the Government undertakes to supply cultivators with all necessary directions for the carbon disulphide treatment and to facilitate the purchase of insecticides and of injectors. To this end it first imported carbon disulphide from abroad ; and later, in 1886, it established a national factory at Zalatna (Transylvania) which was afterwards followed by another established at Pozsony by the Dynamite-Nobel Society. These two factories are able to supply the demands of the country. Further, the Minister of Agriculture has installed in the different vine-growing districts of Hungary stores of carbon disulphide (there are at present 104) coming from the two above-mentioned factories. The cost of the transport from the factories to the stores is defrayed by the State.

In some of the vine-growing districts, the Minister of Agriculture has established model vineyards which are treated with carbon disulphide in order that those interested in the systematic use of this remedy may see the results that may be obtained. In 1911, the area of vineyards treated with carbon disulphide in Hungary amounted to 99 815 acres, of which the greater part was newly planted.

In order to spread the prophylactic measure of using American stocks which are phylloxera-resistant, the Minister of Agriculture has planted many experiment fields in the country ; he has also taken trouble to raise in the State nurseries, and place at the disposal of vine growers the stocks necessary for reconstituting vineyards. The stocks and grafts of American vines produced in these nurseries are on sale every year at moderate prices ; but in order to prevent speculation, they are only sold to vine-growers for use in their own vineyards.

The experiments made have proved that *Riparia Portalis* (Gloire de Montpellier), *Vitis Solonis*, *Rupestris Monticola* and *Rupestris Metallica* give the best results as stocks ; these varieties are also grown by preference in the State nurseries. About 2 500 000 grafts and from 40 to 50 million cuttings are produced annually.

In addition to the State nurseries, these are others made by the communes, municipalities, viticultural associations and also by private individuals; these enjoy the support of the Government and also place on the market every year many millions of cuttings and of scions for grafting. The grafts are usually whip-grafts. In some regions, herbaceous grafts are also made in the following way: American vines on their own roots are planted in the nursery, and in the following June, the green scions are grafted upon them, while in the autumn of the same year, the grafted vines are planted out in the vineyards.

Law 5 of 1896, which was passed for the encouragement of vineyard reconstitution, gave a great impetus to vine-growing in Hungary.

This law allowed vine-growers to obtain the funds necessary for replanting by means of loans granted without guarantee at a relatively low rate of interest, and under advantageous conditions which would have been impossible without the assistance of the State which assumed the responsibility of these loans. The latter were made by a special Committee composed of delegates of the Ministries of Agriculture and of Finance, and of the representatives of the Hungarian " Banque Agraire et des Rentes ", which at once provided the funds.

According to the provisions of the above-mentioned law, loans for the purpose of vineyard reconstitution could be granted until the end of 1910. Since that date, they have no longer been obtainable.

These loans, which are redeemable at 5.25 per cent, offer two advantages over other mortgage loans, viz.: the loans are not made in bonds, but the whole sum is paid in cash ; on the other hand, repayment is not required until the vineards begin to bear (but must be made not later than November 1 of the fifth year reckoned from the payment of the first instalment of the loan), unless the borrower wishes to anticipate the repayment. Repayment is made in fifteen annual payments due every 1st of November. Loans have only been granted for the purpose of the reconstitution of vineyards attacked by phylloxera and upon the condition that either vines grafted on American stocks are used, or else European vines treated with carbon disulphide. From 1897, the date of the first loans, until the end of 1910, when loans were no longer made, 9099 vinegrowers received on loan the sum of £ 1 252 530 for the reconstitution of vineyards occupying a total area of 17 042 ar. cad. (about 24 700 acres).

These loans have had a good effect both upon the reconstitution of vineyards and the propagation of systematic vine cultivation.

The fact that the borrowers are obliged by the terms of the law to cultivate their vineyards in a systematic manner according to a prescribed method of management, and are under the control of experts, until the whole loan is repaid, has largely contributed to systematic cultivation, since even those vine-growers who have not borrowed money, are quickly learning the principles to be followed.

Before the invasion of phylloxera the importance of sandy soil for vine-growing was unknown in Hungary.

Since the immunity of sand has been recognized, the vine-growers are increasingly encouraged to make experimental plantations on sandy soil. These experiments have shown that excellent wines can be obtained from vines growing on the latter, provided the vines are carefully selected, and that the rules of systematic cultivation are observed. From this date, a great impetus was given to vine-growing on sandy soil and land with shifting sand, which was once valueless, is sold at prices which could never have been obtained before the appearance of phylloxera.

The credit of having taken the initiative in this matter belongs to the Government. In 1883, it established the first nursery and the first experiment fields on sand, thanks to the patriotic generosity of the town of Kecskemét which gratuitously made over to the State an area of 284 acres which received the name of "Miklós telep" (the Miklos nursery). This measure was destined to save the excellent Hungarian vines (1).

Further, towards the end of last century, the Minister of Agriculture divided, under very advantageous conditions of payment, an area of 5 000 "arpents" (7 109 acres) on the national domain of "Deliblat" (County of Temes) amongst the vine-growers who had suffered from phylloxera. It also obtained for them, under very favourable conditions, other land with sandy soil (2 943 arpents cad.) 4 184 acres in the counties of Komárom, Fejer, Somogy, Pest-Pilis-Solt-Kiskum, and Szaboles.

According to official statistics there were, in 1911, in Hungary proper 317 222 acres of vineyards on sandy soil, most of which had been planted since the phylloxera invasion.

After phylloxera, mildew and *Conchylis* have caused most injury to the Hungarian vineyards; the former made its appearance in 1891, while the second was first recorded some years ago. At present, the use of Bordeaux mixture as a remedy for mildew is widespread throughout the country. In 1911, 716 191 acres of vineyard were sprayed with this compound. Thanks to the intervention of the Hungarian legislation, these new and replanted vineyards enjoy exemption from taxation for ten years, no matter what method has been adopted in their reconstitution. Those replanted in sand enyoy 6 years, exemption.

In Hungary proper, there are at the present time 8 National Schools for Vine-Growers founded by the State and grouped into two categories: secondary schools for practical and theoretical instruction, and primary schools for practical instruction only. The course at the first is 2 years, that at the other is one year. In all these schools, instruction is free, and most of the students also enjoy free board and lodging. For the purpose of propagating and developing the systematic handling of wines, the State established in 1901 at Budafok, in the vicinity of Budapest, a Special School for Cellar Masters, with large cellars capable of storing 1 100 000 gallons of wine. The vintage of the State vineyards and experiment fields is taken to these cellars, where are to be found types of all the best wines of the country. The school course lasts for 5 terms. In order to be admitted the candidate must have sucessfully taken a two years' course in a vine-growers' school. The course is free, and poor and deserving students receive some assistance. Besides the cellar-masters' course at Budafok, there are travelling cellar masters who, at the request of the vine-growers, will visit their cellars and impart the necessary instruction for the systematic handling of the wine.

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(1) See No. 768. *B.* May 1912. (*Ed.*).

In addition to the schools, there are periodical courses organized by the State Inspectors of Viticulture which also serve to spread the principles of viticulture and of systematic wine-making.

The higher instruction devolves upon the Superior Course of Viticulture and Wine-making instituted at Budapest in 1892. To this are only admitted pupils who have passed through the Superior Agricultural Institutes.

We must also mention the Central Ampelogical Institute founded in Budapest in 1900. Its work is divided into 4 sections: *a*) plant biology and pathology; *b*) chemistry; *c*) zymotechnology; *d*) practical vine-growing. The results of the experiments, researches, and scientific studies of the Institute are published in its Annals. In 1911, the Institute examined 3248 samples and wrote 4282 letters of information.

Amongst the Hungarian wines, the most celebrated and the best is Tokay (Tokaji asszu) which has a world-wide reputation and well deserves the name of "king of wines". Its natural sweetness is due to the fact that the grapes are allowed to dry on their stems.

"Szomordui de Tokay" is also an excellent dessert wine; it is not very sweet, but is strong, full-bodied and aromatic. The new Hungarian wine law of 1908 has delimited the Tokay-growing district, which only consists of the vineyards of 31 communes. This law insures to purchasers that the wine they buy in the Tokay district is the product of the region which is legally delimited.

Other vine-growing districts of Hungary also produce excellent dessert wines, and even in good seasons, natural sweet wines, but the quality of the last is much inferior to that of the Tokay wines. The Transylvanian wines made from Rhine Risling, Sauvignon and Semillon are especially remarkable; their quality rivals that of the celebrated Rhine vintages.

Hungarian wines have long been known abroad. The adjoining table gives some figures relating to the foreign trade in Hungarian wines and shows the quantity and total value of the must and wines exported and imported in casks and bottles.

Year	Exports	Imports	Exports	Imports
	Gallons	Gallons	£	£
1885	23 337 336	1 975 468 (min)	1 072 907	600 656
1888	32 846 814 (max)	3 521 408	1 521 226	984 836
1890	29 471 794	5 065 192	1 946 560	1 155 425
1892	15 898 102	15 951 056	1 428 545	1 070 625
1895	17 158 020	16 957 072	1 634 977	848 075
1897	17 239 552	28 969 418 (max)	1 447 899	1 282 896 max.
1899	13 415 732 (min)	27 107 960	1 128 215	1 220 773
1900	16 258 176	20 063 076	1 377 969	1 019 010
1905	18 290 602	8 078 554	1 227 798	392 677
1908	21 989 792	7 659 212	1 199 406	381 160
1911	31 467 634	4 844 686	2 394 822	399 590
1912	32 817 136	7 446 736	2 892 894 (max)	632 197

The gradual diminution of the exports since 1888, in which year they attained their maximum, is chiefly due to the ravages of phylloxera which much reduced the grape crop. Between 1900 and 1908, the exports again showed a tendency to increase; in 1912 they reached 32 817 136 gals., worth about £2 892 894, which is greatly in excess of the value of the wine exported in preceding years. As for the imports, they increased considerably from 1891, and attained their maximum in 1897; this must be attributed partly to the perceptible decrease in the national production, and partly to the effect of the commercial treaty concluded between Austria-Hungary and Italy.

According to this treaty, which came into operation in 1892, and was in force until 1904, the contracting Powers reciprocally reduced the duty on all wines entering the country in casks, viz: Italy reduced the tax from 8.65*d* to 2 ½*d* per gal. and Austria-Hungary in the case of some classes of Italian wines, from 18.17*d* to 2.9*d* per gal. Nevertheless, owing to the rapid increase of vineyard reconstitution, the importation of wine continued decreasing, and in 1912 was only 22 per cent. of the exportation.

Lately, the Government has also been engaged in providing the vine-growers with facilities for the sale of their wines and the increase of their prices. For this purpose, it has decided to establish in the chief vine-growing districts of the country 10 large national cellars where the producers can deposit, handle and sell their wines. Most of these cellars will be open from 1913.

The production of dessert grapes has of late years received a great impetus. The following table gives some figures respecting the foreign trade in this fruit.

Year	Exports	Imports	Exports	Imports
	cwt.	cwt.	£	£
1886	93 922	2 073	64 106	1 747
1890	104 526	3 580	106 454	4 285
1895	51 478	13 267	65 270	23 546
1900	87 036	41 511	73 590	32 032
1905	218 486	25 782	144 186	17 514
1908	290 706	15 993	183 830	6 947
1910	155 622	8 659	147 347	7 197
1911	221 386	8 418	209 997	7 363

The manufacture of sparkling wines and of brandy (cognac) is also considerable. In 1911, 265 166 gals. of Hungarian brandy, worth £104 752, and 96 580 gals. of sparkling wines, valued at £25 984 were, exported. On the other hand, in 1911, 42 440 gals. of brandy, worth £29 454, and 103 026 gals. of sparkling wines, worth £59 211, were imported into the country.

Hungary, which is jealous of the good reputation of its wines, takes severer measures for the repression of fraud than most other wine-producing countries. The first Hungarian law concerning wine adulteration was promulgated in 1893, abrogated in 1908 and replaced by a new law (law XLVII of 1908 which came into force on January 1, 1909). The most important provisions of the latter are concerned with the prohibition and restriction of the addition of alcohol and of sugar. The salutary effect of this legislation has already begun to make itself felt.. Statistics also prove, as we have shown, that there has been a considerable increase in the export of Hungarian wines and of their price during the four years that have elapsed since the new law came into force, which is a proof of the increased confidence felt abroad in the wines of Hungary.

The Present State of the Question of Inbreeding in Germany

by

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The term "inbreeding" (Inzucht) was formerly frequently used to mean breeding of pure races (Reinzucht or Rassenzucht), whilst today it is limited to the persistent pairing of nearly related individuals. And while a further extended inbreeding ends in becoming a simple breeding of a pure race, still it is always desirable for the greater clearness of the whole question that under the term "inbreeding" the blood relationship be clearly understood. For consanguineous breeding in the narrowest sense the German breeders continue to use term "incest" (Inzest).

According to passages of Aristotle and Ovid it appears that the ancients did not scruple to practise the closest consanguineous unions. From the middle ages but few documents have come down to us containing the views of breeders on the subject; and while some writers recommend inbreeding others pronounce against it. In horse breeding it may often have been employed according to a well-thought-out plan, but in general the conditions of the middle ages were not adapted to the application of carefully studied principles. The frequent cases of inbreeding occurred without any system being followed, out of sheer ignorance of its dangers, or of indifference and also from the impossibility of changing certain conditions.

In England, as is well known, systematic inbreeding was largely used with the object of forming improved breeds endowed with certain qualities; but it would be an error to believe that in England the system had no opponents or that it was always attended with success. Notwithstanding the greater experience of English breeders and the extension of pastures favoured by the climate, there has been no lack of warnings raised in England against the evil consequences of inbreeding. And while, for instance, Culley was convinced of the innocuity of properly conducted inbreeding, John Sinclair, Prinsep, Sebright and others insisted that continued inbreeding would be followed by debility, disease and sterility.

In France, also, the chief breeders have expressed their opinion on the question. Sanson recognises in inbreeding a powerful means of improvement, Cornevin communicates a whole series of facts of his own experience and in the main is not inclined to take the dangers of inbreeding too seriously. On the other hand Baron believes that a too long continued use of close breeding leads to sterility. On the whole the opinions of the leading men in France seem to differ quite as much as they do in Germany. At present, however, there is no doubt that in the matter of thorough research for the elucidation of the question the greatest progress has been achieved in Germany.

It is beyond discussion that in the old times of German stock breeding inbreeding was not at all discountenanced. The former tendency laid great stress on complete purity of breed and looked askance at crossing. In such a state of affairs frequent inbreeding was the result and it was approved of even among the nearest relations (In zest), provided it was practised among perfectly sound animals. Owing to the partially very good results obtained by crossing with English blood, the theories of pure breeding and of constancy were shaken, and inbreeding which was one of the main points of the programme fell into undeserved discredit. Stress was laid upon the unsuccessful results which inevitably follow on haphazard inbreeding, and which in Germany were all the more to be expected as almost everywhere stall keeping prevails and the interests of agriculture are predominant. Finally the great value of a national building up of blood by inbreeding was no longer recognized, and even now it appears that in buying breeding stock more stress is laid upon the absence of consanguineity than upon any other point. There came a time in which the individuality was considered more than anything else, and the science of form underwent a far-reaching development. The performance tests followed, and now-a-days there is a partial return to the ideas of the old views on the constancy of characters which laid so much value on the ancestry. Only that the latter is now, more than in previous decades, connected with inbreeding and the care bestowed upon certain lines of blood.

This development need not convey the impression of gropings in the dark. The development of individual examination was certainly not useless, and the sharp insight of the breeder can never be replaced by pairing according to tables of pedigrees. Anyhow it is too radical to maintain that it is impossible to draw any conclusion as to performance and breeding value from the outer appearance of the animals. The pedigrees point out the way to a systematic building up of the breed, but for judging the value of an animal the decision will always be given by the outer conformation and by the performance.

It may be that the great importance attributed by breeders to ancestry and pedigree may be due to studies on human conditions. Genealogy, which has become a special science, seeks and examines the descent and family relations of men, making use of chronicles, ecclesiastical records, lists of corporations and the like. Many historical events become psychologically intelligible only when the families (together with their characteristics) of the principal actors are known.

Genealogical science has also investigated inbreeding, and very important knowledge has thus been gained. In the first place researches on individual families have shown how tenaciously certain traits are inherited, and how important it would be in contracting marriage to possess ample knowledge of the respective families. The works of REIBMAYER, SOMMER, ZIERNIER and others are of the greatest interest in this connection.

Count von Lehndorff will always have the merit of having been the first in his *Handbuch für Pferdezüchter* (Handbook for Horsebreeders) to illustrate by means of painstaking work and the necessary proofs, the bearing of inbreeding and breeding by families in the raising of horses. He thus showed the way to be followed in applying to other kinds of animals a great part of what he had discovered in the breeding of Thoroughbred horses. The severe strain upon the constitution which is afforded by racing is already a selection of all those animals which are best adapted to stand the injurious effects of inbreeding. Similarly, in breeding half-bloods, the conditions for obtaining health and a good constitution are in general more favourable in horses than in other animals.

Nevertheless Herr v. Oettingen, who has studied further the question of inbreeding in the light of his ample experience, and also from a theoretical point of view, insists that close inbreeding frequently maintains its evil consequences. In his book *Zucht des edlen Pferdes* (Breeding of Thoroughbred Horses) he says "unfortunately many insuccesses are recorded in the Trakehner Studbook when inbreeding closer than that of one "free generation" (1) was used. A weak, delicate constitution, light bones, and sterility have also been among the Trakehner half-bloods the consequences of inbreeding pushed too far. With a natural breed endowed with more robust constitution, such as the Steppe breeds, close inbreeding with one or no free generation, may be practised without any bad consequences for a greater length of time than with the improved breeds. Indeed even within the improved breeds the more robust, *e. g.* the Thoroughbreds, as said above, seem to stand close inbreeding better than most half-bloods, especially those too delicately nurtured. The old experience, that continued inbreeding may lead at last to serious drawbacks must not be considered too lightly by modern German breeders.

Dr. de Chapeaurouge, of Blankenese near Hamburg, is a medical man who has devoted himself to the study of inbreeding and has recently taken a foremost position in the investigations on the pedigrees of domestic animals. His book on inbreeding (Rademacher, Hamburg) treats the subject exhaustively, and the whole present movement is intimately connected with his name.

Gustav Rau in his book *Die Not der Deutschen Pferdezucht* (The Requirements of German Horse-breeding) has demonstrated how valuable inbreeding has been in the development of all our half-blood breeds. For several years past the "Deutsche Gesellschaft für Zuchtungskunde" (German association for the science of breeding) has exerted itself, together with Dr. De Chapeaurouge, in the investigation of the nature and effects of inbreeding and in the efforts to render the importance of systematic progress in this direction clearer to the breeders. The collection of pedigrees that Dr. De Chapeaurouge already possessed has rendered possible the institution of a special archive for the investigation of ancestors and of inbreeding. Courses of instruction have been started and the Society has besides undertaken to supply pedigrees for the animals of certain breeds. In a special pamphlet the Society has proposed a uniform form and mode of entry for pedigrees so as to render them easier to read (1). These proposals deserve to be taken into consideration and they will doubtless lead to a more general recognition of the importance of breeding by families and by certain lines of blood.

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(1) Instead of the English word "remove", Count Lehndorff uses the German words "freie Generation" the sense of which differs somewhat from the former.

In order to count the removes between a given animal and one of its ancestors represented both on the paternal as well as on the maternal side, each generation on either side is counted separately, including the parents of the animal in question.

On the other hand in counting the "free generations" the sire and dam are omitted and the other generations are counted together both on the sire's, side and on the dam's. (*Ed.*).

How does the question stand at present in Germany? In horse-breedding, as has been said above, Count LEHNDORFF and v. OETTINGEN are at the head of the movement and their decisive investigations have demonstrated that the prospects of success with inbreeding are most propitious with about 4 free generations. When in the improved conditions of a district provided with pure-bred animals, the best are always used for breeding purposes, the result is that the most valuable races become better known and esteemed, and inbreeding gets introduced by itself. As on the other hand too close inbreeding is feared, very likely the aproximately right proportion will be found by practice. This has proved true in the systematic investigation of descent in the most varied fields of breeding and holds good not only for Thoroughbred horses, bot also for Rhenish draught horses, as has been fully demonstrated by Dr. FRIZEN'S recent work os their most important lines.

In the breeding of cattle under present conditions, especially in peasant farms a great deal of inbreeding is practised and the mischief is often unmistakeable. On the other hand, here also often a systematic and well calculated inbreeding is carried out, and it appears to be an excellent means of improvement. Unfortunately in the German Empire the investigation on inbreeding in cattle cannot be everywhere sufficiently pursued because the keeping of herdbooks is comparatively too recent. But in the districts where Shorthorns are kept and in East Friesland better conditions obtain, and for the East Prussian breeding PETERS has produced a fine work on the use of inbreeding and the breeding of certain lines of blood. It appears that here also, as in East Friesland and in Schleswig-Holstein, the blood of certain remarkable ancestors has a special significance and that the success in breeding depends to a great extent upon the continued connection with these lines.

In the breeding of pigs, inbreeding was formerly almost generally avoided and, considering the prevailing custom of keeping them in sties, it was quite right to do so. Recently, however, it is sufficiently well known to what extent breeders practice inbreeding and the systematic breeding by lines. Thus, for instance, **Hoesch** has pointed out that in breeding the improved Neukirchen pigs, the inbreeding of specially strong animals gives an offspring possessing unfailing good growth, high powers of utilizing food and fine shape.

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(1) See No. 546, *B.* May 1913. *(Ed.).*

As for sheep breeding there is no doubt that in England as well as in Germany, much use has been made of inbreeding. Recently Dr. **Schmehl**, in part 15 of the publication of the "Deutsche Gesellschaft fur Züchtungskunde" (German Society for the science of breeding), contributes an investigation on the conditions of breeding in the Zemlin Rambouillet flock, and here also it appears that most of the animals are the result of a decidedly close breeding. If frequently the objection is raised that excellent sheep flocks have been ruined by inbreeding, the accompanying circumstances should be looked into. In a preceding paper I have shown that at the time when all efforts were directed to the production of very fine wool, they led to a general refinement of the whole body of the sheep. It is evident that the bodies thus rendered delicate were not the most suitable for inbreeding, though on inbreeding in itself this cannot be considered as an equitable verdict. (1).

Especially remarkable are the observations that refer to systematic inbreeding for the production of exceptionally fine sires or good dams. **Bruce Lowe**, in his work on the breeding of racehorses, upholds the principle that excellent stallions can best be obtained when the sire is paired with a mare who possesses in her line some famous individual which is found also among the maternal ancestors of the same sire.

An instance of such a pedigree is furnished by the genealogy of "Araber", a Thoroughbred of the Württemberg Oriental stud at Scharnhausen (after Adlung).

Araber	Salamander	Doge	
		Sarah	*Amurath* ■
	Amadine	Padischah	
		Amourette	*Amurath* ■

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(1) Die Kontroverse über Rassen-Konstanz und Individualpotenz, Reinzucht und Kreuzung, Berne, K. J. Wyss, 1905.

HOESCH has made some observations in his herd of native improved pigs at Neukirchen which tally perfectly with Bruce Lowe's opinion. According to this method of pairing a whole series of very good boars was obtained. The pedigree of one of them, " Nero ", is here given as an illustration.

On the other hand excellent dams were obtained by a composition of the strain in which the remarkable ancestor, as basis of the inbreeding, is found not only on the mother's side but also in the paternal series of ancestors of the sire. An instance is afforded by the pedigree of " Ruhe ,,.

Nero D. L. G. III. Prize	2059 III. Prize	883 N. D. L. G. Ia, Ia, Ia Prize	925
			Richard D. L. G. Ia, III, I Prize [redacted]
		Herronin	
	Naturkraft	883 N.	925
			Richard. D. L. G. Ia, III, I Prize [redacted]
		Kraft	

Ruhe D. L. G. IV, II, III Prize	3283 D. L. G. I Prize	1850	884
			Richard [redacted] Ia, III, I Prize.
		Riese	08
			Richard [redacted] Ia, III, I Prize.
	Rudhard	015	
		Rubin D. L. G. II Prize	St. 4
			Richard [redacted] Ia, III, I Prize.

We may safely say that in Germany in all the important branches of stock breeding the question of inbreeding is being most actively studied. Instead of entertaining opinions, views and prejudices, the tendency is to form a solid foundation of facts. These efforts have a far-reaching importance and in all cases when the herd books have allowed it they have obtained valuable results. It has been found everywhere that really important breeding animals always belong to families in which the excellence of their blood is especially due to a few' preeminent ancestors, and when this is recognized the real value of inbreeding and of lines of blood is put in its true light. Consequently no expert would think of recommending a careless use of inbreeding, and the great number of insuccesses of the method, even in the hands of good breeders, is not denied by any one.

On the whole the present tendency is towards emphasizing selection, a more rigorous picking out of favourable hereditary variations. Those also who believe in the heredity of the good qualities and improvements that animals acquire through being well cared for must admit that in the great number of animals there are only a few that transmit with certainty to their offspring their special traits of form and of performance. It may be that these qualities derive from favourable modifications of the germ plasm of the parents. The connoisseur's judgment for the beauty of the animal, and the tests for its performance must be increasingly applied in connection with breeding according to pedigree, in order to spread throughout the breeding districts the high quality of the blood of certain animals by the greatest possible utilisation of inbreeding. How it happens that of these animals possessing remarkable qualities only a few are capable of producing important results in consanguineous breeding and in breeding by families, while others completely fail to do so, is a question that at present is shrouded in obscurity. Some light could perhaps be soonest thrown on the question by researches in sheep breeding, for the flock books give an idea of the conformation and of the build of the animal in relation to its resistance. Here I agree fully with C. LEHMAN, who, in No. 16 of the *Deutsche Landwirtschatliche Tierzucht* of this year, regrets that Dr. SCHMEHL had not extended his investigations in this direction also. It might perhaps have been shown how often the insuccess of certain animals is due to a weak constitution and how far it may be due to other causes. Such causes might appear to be that the blood of the unsuccessful animal on which the inbreeding was based (basis of inbreeding) was not yet sufficiently fixed, or the case might be led back to the above-mentioned question, namely whether the merits of the basis of inbreeding derive from favourable variations of the germ plasm (are blastogens) or from better conditions of environment (acquired qualities). In the latter case heredity could tell less.

Be it as it may, practical breeding can hope for great results from the present aims and methods.

From a biological point of view however, it would be of the greatest importance if the question of inbreeding among the various animals were studied in connection with the theory of chromosomes. Probably very useful results would be obtained.

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Utilization of Skimmed Milk as Food for Calves.
Summary of Experiments carried out on 60 Calves.

by

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One of the first subjects to which I devoted my attention on assuming the directorship of the Zootechnic Institute of the Royal Agricultural College in Milan was to make investigations with the object of solving the following problem: which is the best way, for Lombardy, of utilizing skimmed milk in the feeding of calves. In this connection between 1905 and 1911 I carried out seven series of experiments on 116 calves divided into several groups, to each of which I gave skimmed milk mixed respectively according to a special plan, with rice-flour, maize meal, potato starch, oleo-margarine, whole milk, oleo-margarine and potato-starch, chestnut flour, potato-starch treated with diastasoline (1) and lastly with oleo-margarine and potato-starch treated with diastasoline or with levuline (2).

As may be seen from the reports published in Vols. VI, VII, VIII, IX and X of the *Annuario della Istituzione Agraria Dr. Andrea Ponti*, attached to the Royal Agricultural College in Milan, the best physiological and economic results were obtained from calves fed with skimmed milk, oleo-margarine and starch treated with diastasoline or levuline. These calves were 60 in number, belonging to five series of experiments, four of which were carried out by the Zootechnic Institute and one in the stables of D. F. Sigurta at Comabbio (Como), always following nearly the same general rules. Here I shall, in the first place, describe these rules and the conditions under which the various experiments were conducted, and then I shall summarize the physiological and economic results obtained.

The 60 calves before being subjected to the experiments were carefully examined, especially as to their health and hardiness ; nevertheless some of them became sickly a few days after being placed in the stables, but they soon recovered and did not in any way disturb the course of the experiments.

Every calf was kept after its birth or purchase on the three following successive diets : 1. whole milk ; 2. transition diet during which the whole milk was gradually replaced at the rate of 1 litre (nearly 1 quart) a day by skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline ; 3. economical diet, that is skimmed milk, oleo-margarine and starch treated as above. Besides, 11 calves were given small quantities of linseed cake during the last 10 or 15 days of the experiment in order to see if it were possible to force the animals to finished fattening in less time. The duration of the first diet, depending chiefly upon the degree of hardiness of the calves and their weight, ranged between 1 and 33 days and in the greatest number of cases, between 15 and 26 days. The second or transition period — at the beginnining of which the weight of the calves ranged from 110 to 191 lbs., and in most of them between 121 and 136 lbs. — varied from 6 to 8 days. The third period, that of the economical feeding, lasted from 14 to 70 days, most frequently being from 1 ½ to 2 months. The total duration of the individual experiments in the greatest number of cases was 2 months to 2 ½ months : on.y in 4 cases they lasted respectively 90, 102, 103 and 106 days.

The food given was analyzed in the Laboratory of Agricultural Chemistry of the Royal Agricultural College of Milan.

The doses of oleo-margarine and of starch added to every gallon of skimmed milk in order to bring it up again nearly to what it was before being separated were determined by considering the results of chemical analysis and those obtained from calves submitted to preliminary tests. The doses were thus fixed: 4 oz. of starch and 3.2 oz. of oleo-margarine for 36 calves; 4 oz. of each for 20 calves; and respectively 4.8 oz. and 3.2 oz. for 4 calves. The quantity of linseed cake added to the other food for 11 calves was 1.76 oz. for a couple of days; this was successively raised by 1.76 oz. at a time up to 5.3, 7 and 10.6 oz. according as the linseed was relished.

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(1) Diastasoline is a saccharifying substance that the Deutsche Diamalt-Gesellschaft of Munich extracts from malt.

(2) Levuline is a product of the « Distillerie Italiane » Company, at Padua ; it has a fairly high power of transforming starch into dextrine; its saccharifying power is rather low. It is used by bakers to hasten and complete the action of yeast and to obtain a better quality of bread.

The determination of the quantity of the rations was made taking into account the appetite and the daily gain in weight obtained by weighing the calves before the morning feed. The increase in weight is the safest test, both for the sufficiency of the ration and for detecting if there is anything wrong with the health of the animals.

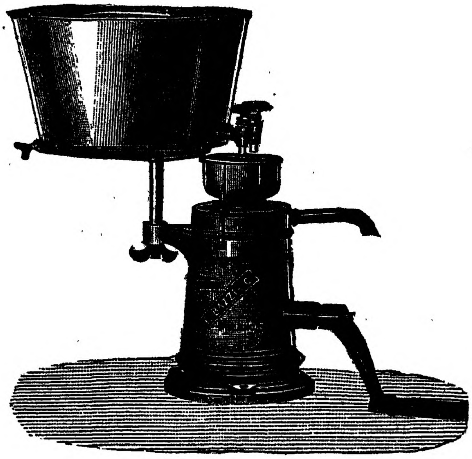


Fig. 1. — Bazzi's Emulsifier.

The quantity of whole milk, or of skimmed milk mixed with other foods, given daily when the animals were in good health, beginning from a week or two after birth or purchase ranged between $\frac{1}{6.1}$ and $\frac{1}{13.4}$ of the weight of the animal.

In the preparation of the rations the following system was followed: the starch was mixed with an equal weight of cold skimmed milk, then boiling or nearly boiling skimmed milk was gradually added and continually stirred, the quantity being seven times the weight of the starch. The jelly-like liquid was allowed to cool to 122 to 140° F. and then diastasoline previously dissolved in some tepid water was added to it at the rate of 10 per cent. of the weight of the starch, or levuline (at the rate of 30 per cent. of the starch) dissolved in an equal quantity of skimmed milk at the temperature of 122 to 140° F.; lastly when the mixture had become liquid it was added to the rest of the skimmed milk in which the dose of oleo-margarine had been emulsified by means of Bazzis' emulsifier (Fig. 1).

The rations were given in Zappa-Pirocchi's sucking-pail (Figs. 2 and 3) at a temperature of 93 to 95° F. During the first days of the first period of the experiments, *i. e.* during the whole-milk feeding period, the rations were given three times a day, excepting in some cases in which the whole milk was given four and six times and even more on account of intestinal troubles. In the second and third periods, with but few exceptions, the feeds were given only twice a day.

The stables in which the 49 calves were kept, though not perfect from a hygienic point of view, were fairly good. They have a good aspect and are sufficiently large to counteract the ill-regulated ventilation; the temperature during the experiment ranged from 53.6° F to 64° F; the light was conveniently moderated so as to kep the calves in semi-darkness; the pavement. which is slightly inclined, is of cement, and the walls of the stable are lined with cement up to a height of 52 inches from the ground; the stalls are separated from each other; some are 66 by 52 inches, others 76 by 52 inches. Very different are the shelters in which the remaining 11 calves were kept. Nine of them were placed in an old shed, exposed to the south, measuring 1942 cub. feet, and imperfectly ventilated; it was very warm and on some days the temperature reached as high as 86° F. in the afternoon. Lastly the remaining two calves were put together with cows and other animals in a large stable in which — owing to the unfavourable aspect of the building, to defective ventilation and to changeable weather — the thermometer had a wide range, from 63° up to 93° F.

In order to prevent the calves taking exercise, they were tied up short to the stalls; and to prevent them eating the straw of their litters they were kept always muzzled except at feeding time, after which their muzzles and lips were cleaned with a cloth.

Especial care was bestowed upon the cleanness of their coats; every morning before feeding they were groomed down and those parts that were soiled by excrements were washed and dried.

The physiological results of every series of experiments were deducted from observations carefully made with the object of determining: the ininfluence of the various feeds upon the health of the calves; the increase of weight, total and daily, of each calf during the three diets and during the whole experiment; the quantity of food consumed by every calf in the above periods, and per pound of gain in live weight; the character of the flesh and the net yield in butcher's meat.

As for the economic results the following were calculated: the cost of one pound of gain in live weight, for each of the three diets and for the whole duration of the experiment, in comparison with the cost of the

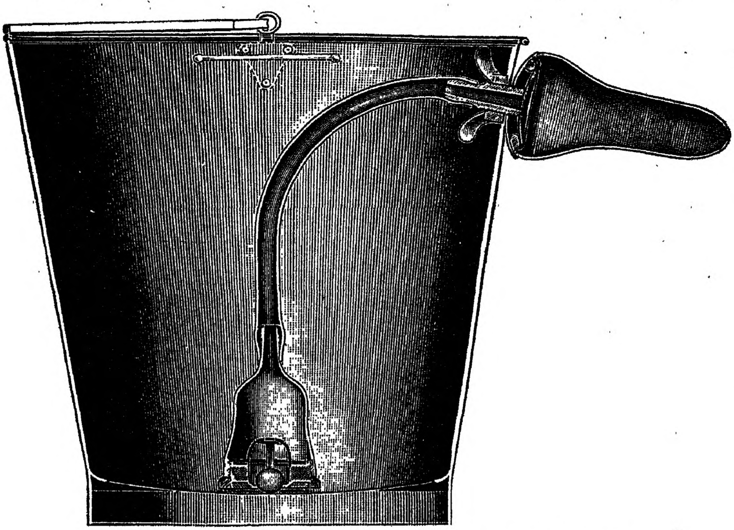
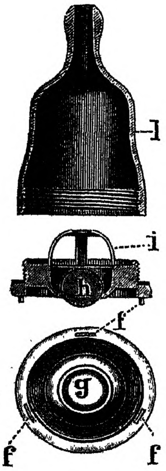


Fig. 2. — The Zappa-Pirocchi sucking pail, fully equipped.



f) foot on which the apparatus rests;

g) circular aperture through which the milk passes on being sucked;

h) rubber ball which, rising and falling during suction, opens and shuts the circular aperture *g*;

i) cage for rubber ball;

l) upper part of apparatus, which screws onto the foot, while its top is connected with the rubber tube leading to the artificial teat.

Fig. 3. — Section of the valve apparatus in the Zappa-Pirocchi sucking pail.

same gain in calves fed only with whole milk; the price which a gallon of skimmed milk fetches when utilized by the calves (1).

Health conditions of the calves. — During the whole-milk diet one calf suffered from a rather serious scour, which ceased after a few days by treatment with small rations of milk mixed with lime-water and laudanum; another calf fell ill of pleuro-pneumonia and soon recovered, but traces of the disease were found when the animal was slaughtered. During the transition period only one calf — among those which were fed on skimmed milk mixed with oleo-margarine and starch treated with levuline — had some gastro-enteric trouble accompanied by scouring and loss of weight: consequently the calf was fed again upon whole milk in small and frequent doses (three or four a day), but after about a week was again submitted to the transition diet and afterwards to the economical ration without any inconvenience. During the third diet, health conditions were good, except for three calves — among those that were fed skimmed milk with oleo-margarine and starch treated with diastasoline — one of which was seized with pleuro pneumonia after one month from the beginning of the economical diet and had to be sold immediately; the other two suffered slight and brief intestinal troubles with excretion of soft and acid - smelling faeces in one case, and whitish hard and foetid faeces in the other. It is also to be mentioned that 10 calves — 8 of which were subjected to the skimmed milk, margarine and starch treated with diastasoline diet, and 2 to the skimmed milk, margarine and starch treated with levuline diet — showed themselves poor feeders, leaving portions of the morning or of the evening feed; it was ascertained that in 5 of these calves the fact of their leaving part of their ration — even of whole milk — was not due to any health trouble or to the quality of the food, but only to habitual lack of appetite; whilst for the other 5, the refusal to finish their food was due to the linseed cake which gave an unpleasant odour to the rest of the food and for this reason its use was discontinued.

Increase of weight. — The following figures show the average daily gain in weight.

In the first period, whole milk	1.54 lb.
» second period, transition feed	2.17 »
» third period, skimmed milk mixed with oleo-margarine and starch treated with diastasoline or levuline	2.00 »
» whole experiment	1.91 »

The small gain obtained in the first period, during which the calves were fed whole milk, is due to the fact that many cattle men have the deplorable habit of giving the calves as much milk as they can swallow on the morning of the sale, in order to make them weigh more; the result is that to avoid serious gastro-enteric troubles they must be kept on short rations for a few days, giving them only small quantities of milk. This causes a slackening in the live weight gain and sometimes even a loss during the five or six days following the sale; this diminution is only partly compensated by the successive normal increase. This is the chief reason for which the average increase observed during the first period cannot be compared with the gains made during the other periods so as to form an idea of the respective advantage of the whole milk and of the skimmed milk, oleo-margarine and starch feeds. In order to determine this, another comparison can however, be made. In carrying out the first series of experiments 4 calves were fattened on whole milk, — keeping them in the same conditions of stabling, grooming, etc. as 49 calves out of the 60 experimented upon — in order to demonstrate that there was only a slight, if any, economic advantage of this method of feeding. On comparing the average gain obtained in the time between the birth or purchase and the sale of the 4 calves (1.87 lb.) with those obtained in the 2nd and 3rd periods and during the whole experiment (2.17, 2.00, 1.91 lb.), it will be seen that the gains in weight of the calves fed according to the method set forth in this report were considerably superior to those made by the calves fed on whole milk. To this assertion however no excessive weight must be given, because there are some calves that present still higher gains from whole milk feeds, but such is not the general rule, while many are the calves that on whole milk diet make about the same gains as those fed prevailingly on skimmed milk with the addition of oleo-margarine and starch treated with diastasoline or levuline.

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(1) For the method adopted in these calculations see my reports on skimmed milk in the feeding of calves, in Vols. VI, VII, VIII, IX and X of the *Annuario della Istituzione agraria Dr. Andrea Ponti*, published by the Royal Agricultural College in Milan.

Food consumed. — The average quantities of whole or skimmed milk consumed by the calves for every pound of live weight gained are shown in the following table.

In the 1st period:	whole milk,	8.610	lbs.
» 2nd »	whole milk.	3.879	»
	skimmed milk	3.950	»
» 3rd »	» »	10.341	»
During the whole experiment:	whole milk.	2.029	»
	skimmed milk	7.660	»

If these figures be compared with those giving the quantity of whole milk that is considered necessary to obtain 1 lb. of gain during the first two months of the calf's life (from 10 to 12 lbs.) the following interesting fact is observed: that the average quantities of whole and skimmed milk consumed by the calves during the 2nd period and during the whole experiment and that of skimmed milk consumed during the 3rd period have been nearly equal, and even inferior, to the quantity of whole milk required for the same increase of 1 pound.

Character of the meat. — With the exception of one cow-calf of the Simmenthal breed — which, for its handsome appearance, was bought, at the age of 103 days, when it weighed 297 lbs., for breeding purposes by the agents of the Hon. Senator Marquis Ettore Ponti's estate — all the calves were sold to the butcher and of each of them the quality of the meat was observed.

According to the above observations the 59 calves can be divided into two groups. To the first belong 43 whose quarters in general had a good appearance, with white firm close-grained flesh; the second is composed of the remaining 16 calves, whose flesh was reddish and more or less soft. As for the fat it was white, of proper firmness and abundant under the skin and about the kidneys, in 37 calves: in the remaining 22 it was dirty white and not so plentiful, especially about the region of the kidneys which was only partly covered by fat.

The judgment pronounced on the meat, which was cooked in various ways, was, with the exception of a few carcases, that it was good and sometimes excellent.

It is to be mentioned that as for the quality of the meat several calves fed on skimmed milk with adjuncts were in nowise inferior to those fed on whole milk; this also was the opinion of the butcher, who declared himself pleased with his purchases.

Carcase weight. — The net carcase weight at the slaughter house — calculated according to the custom of the trade at Milan, by weighing the animals diminished only by the weight of the blood, stomachs and intestines — averaged 76.03 per cent. it ranged from 67.29 to 84.64 per cent. of the live weight.

Cost of the gain of 1 *pound live weight;* — The following are the costs per pound of gain in live weight:

In the 1st period: whole milk	5.66 *d*
» 2nd » transition	4.02 »
» 3rd » skimmed milk with adjuncts	3.89 »
During the whole test	4.19 »

A simple inspection of these figures shows the considerable difference between the cost of 1 pound of gain in calves fed on whole milk and that of those fed on skimmed milk with adjuncts. But here also it must be repeated that the figures of the first period cannot be rigorously compared with those of the other periods also for the reasons previously given. Anyhow if it be admitted, as is generally believed, that during the first two months of the life of a calf an average of 10 lbs. of whole milk is required to form 1 lb. of gain, and if the milk be valued at the average price of 6.61*d* per gallon, which was current during the time the experiments lasted, it results that by feeding whole milk from birth to the time of selling, the average cost of one pound of live weight would be about 6.56*d*. that is somewhat higher than the average 4.19 *d* calculated for the 60 calves on the basis of prices which for the various foods given are anything but low: oleo margarine, £2 12*s* 6*d* to £2 16*s* 6*d* per cwt.; starch, 14*s* 3*d* to 18*s* 6*d* per cwt.; diastasoline, £2 16*s* 6*d* to £3 0*s* 6*d* per cwt.; levuline, £2 0*s* 6*d* to £2 8*s* 6*d* per cwt.

Prices realized for the skimmed milk through the calves. — This price averaged 4.97 *d* per gallon But it must be mentioned that in determining it the cost of the other foods consumed by the greatest numbers of calves was calculated at rather high prices and that several of the best calves had to be sold at an unfavourable moment when the prices were low. In some cases, however, the prices realized for the skimmed milk were considerably above the average, reaching as much as 6.45 *d*, 6.76 *d* and 7.56 *d* per gallon. These prices are in part due to the fact that in general the calves were sold at rather high prices; though it is also true that the purchase prices of the calves were higher than usual, as well as the prices of the foods used.

On the basis of the above physiological and economic results it may concluded:

1. — *That skimmed milk mixed with oleo-margarine and starch treated with diastasoline or with levuline may be advantageously employed as food for calves destined for the butcher, according to the methods set forth in this report.*

2. — *That for the so-called reintegration of every gallon of skimmed milk the following quantities may be recommended:* 3.2 *oz to* 4 *oz. of oleo-margarine and* 4 *oz. of starch;* and 1.6 *oz* of diastasoline or 4.8 *oz* of levuline for the treatment of 1 lb. of starch.

Wheats from the British Millers' Point of View

by

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President 1906-07 National Association British and Irish Millers,
Chairman of its Home Grown Wheat Committee

Within the last 30 years, the British flour milling industry has been subjected to revolutionary development in two principal directions, one economic, the other technological. At the beginning of that period, there were 10 000 mills in the United Kingdom producing flour; today, the number is less than 1 000, although the quantity of wheat ground per annum is now 80 per cent. greater than it was 30 years ago. Furthermore, one third of the flour produced in the United Kingdom is made in about 30 large mills situated at seaports.

The following facts are associated with these develop,ments.

a) The acreage under wheat in the United Kingdom has been greatly diminished, so that although the yield per acre has been increased substantially, the quantity of home-grown wheat, which 30 years ago was 36 per cent., is now only about 20 per cent. of our requirements.

b) The standards of excellence in flour have been raised, whereas the average quality of our home-grown wheat has been lowered.

c) The milling system of gradual reduction by means of roller mills has entirely superseded the use of millstones. The mills now existing are well equipped.

d) The development of new countries and the insufficiency of labour in most wheat-growing areas, have caused wheats to contain a substantial proportion of dirt, seeds and other extraneous matter, so that elaborate and costly installations of wheat cleaning machinery have been rendered necessary in our mills.

e) A system of "conditioning" has been elaborated whereby as a result of the skilful use of water, great improvements in the quality of flour, and great changes in the relative values of wheats have been made.

f) Under pressure of extreme competition, millers have to work on exceedingly small margins of profit per unit, and cannot afford to make mistakes in milling or tolerate irregularities in the quality of their manufactured goods.

The very small modern mill cannot secure optimum technical results, so the developments in technology were predisposing causes of its commercial extinction or of its enlargement. A miller who first adopts sound novelties in milling practice, incurs substantial risks, but secures adequate returns, so in the early days of roller milling, many inland mills were increased in size and yielded adequate profits, but when their competitors adopted the same novelties, the economic unsoundness of their position became apparent. Unfortunately, the necessities of our railway companies have greatly accentuated the difficulties of our inland millers. Our railway service is in some respects a very good one, but its rates for freight are high, so that an inland mill which had to depend for its supply of raw material and the distribution of its products upon railway transport could not compete with a mill, which, taking advantage of our relatively great seaboard, could avoid the use of railways in obtaining the wheat it required, and in distributing the whole or a large proportion of its products. The whole story concerning the decadence of our small country mills would be too long for this article, but this summary indicates the great determining cause of the economic revolution in our industry, whereby many inland millers had to close their mills and go out of business, or migrate to the ports, or restrict the size of their operations, so that they could obtain their raw material and distribute their products at a relatively low expense for transport charges.

This excursus upon economics is justified, because it will serve to bring out the reason for an apparent contradiction in these two statements, one that the British miller is willing to buy practically any wheat offerred to him; the other that the National Association of British and Irish Millers has spent much time, through the instrumentality of its Home Grown Wheat Committee, in efforts to improve the quality, and more particularly the strength, of our home-grown wheats, whereby they shall be in the highest degree suitable for the commercial requirements of the district in which they are grown. If they be not improved, the millers of the district will still be compelled to buy suitable foreign wheats, and a large proportion of the native wheat produced in our wheat-growing districts will still be transported at great expense either as wheat or flour to other districts. The railways will still gain by earning freight charges in both directions, but the grower, miller, and consumer will still have to bear the burden between them of the expenditure, which ought to be unnecessary. The Committee already knows that wheats of the highest quality can be produced in an ordinary season in this country, and its efforts are directed principally to obtaining new varieties of prime quality and high yielding capacity. When within a few years that object has been achieved on a large scale, port millers will doubtless seek to buy more wheats than they do now, but the same economic causes which helped them so greatly in the past, will favour the inland miller then, and there is in all probability a prosperous future before these inland firms, which are able to obtain their raw material locally and sell their products in the same district. The position of a firm well equipped with brains, money, and knowledge, operating on such lines, should be commercially impregnable.

The greater part of the flour consumed in the United Kingdom is used for bread making, but some is used for the making of cakes, pastry and puddings, some for biscuits, some in other industries. In some parts of England bread is made at home by housewives or their household servants, but in the greater part of this country, bread is made by professional bakers, who handle large quantities of dough daily. Ordinarily bread is made by means of panary fermentation ; sometimes, for instance in some parts of Ireland, the aerating gas is produced by means of a chemical reaction between an acid and an alkaline body, such as sour milk or acid phosphates and carbonate of soda. For biscuit or pudding making the flour made from existing typical ordinary English wheat, harvested in good condition, is satisfactory, but the flour from such wheat is not sufficiently stable in the dough, or sufficiently "strong" to make satisfactory bread. Farmers and the great majority of inland millers would be better recompensed if we produced at home wheats from which good bread-making flours can be produced, even if we had to import a larger proportion of wheats from which good pudding and biscuit flours can be made. The point I specially wish to make at this juncture is, that wheats of widely differing characteristics are required by British and Irish millers.

My next point is, that market value is not a true index of intrinsic worth. No person, or Government Department, has set up in this country a standard whereby the intrinsic worth of a wheat or flour is to be judged, nor is any such action desirable, but certain characteristics in wheat are highly esteemed, and the trades concerned have come to regard the possession of certain qualities as a measure of intrinsic worth, principally because such wheats are generally in relatively small supply and usually realise maximum prices. A considerable amount of friction must be used in milling, but the millstone applied an unnecessary amount of friction in an unnecessarily severe way. The public demands a white or bright coloured bread, and in these days of good wheat cleaning appliances, the principal cause of dark bread is the presence in low grade flours of an appreciable amount of bran powder. A wheat which is hard and possesses friable skin is more likely to be comminuted than a mellow one; bran powder from a " red " or brown wheat will darken the bread much more than the same percentage of bran powder from a "white" or yellow wheat. So 40 years ago, in millstone days, a wheat which was mellow, white and strong was considered excellent. Hence the high repute in which Dantzic, among foreign wheats, and Chidham, among native varieties, were held in those days. But with the advent of roller milling and imported flours made from wheats grown on the virgin lands of the United States and Canada, the older standards as to excellence of quality were changed, and we gradually came to recognise as specimens of high intrinsic worth, the better grades of Canadian and United States spring wheats, hard friable " red " skinned varieties, containing, a high percentage of nitrogenous matter. Such wheats have for many years realised ordinarily the maximum prices of our markets, but not invariably. For we want other types of wheat as well, and supply and demand are far more influential elements in price making than any current ideas as to intrinsic worth.

The upshot of these considerations is, that British millers do not seek to impose any conditions as to the type or characteristics of the wheats offered them. All sorts and conditions of well-harvested wheat have a value on our markets, and can be sold therein. We do, however, attach great importance to various points of excellence, and believe that the plant breeder can in most, if not in all countries, provide varieties, in the highest degree suitable to the " environments " existing there and to the commercial requirements of millers. British millers are to a greater extent than ever running their mills in a scientific way; some have scientists on their staff. The idea that wheat is sacrosanct is passing away; the newer conception is, that it is a fruit of the earth designed by Nature to be a seed and that in making it fit for use as human food the miller is right in obtaining not the only aid of the engineer, but of the chemist as well. With such aids he is the more disposed to make his own requirements subservient to the interests of growers. But he does ask that the arrangements made for marketing should in all countries be equitable. For instance if " grading " be established in any country, the methods adopted should be uniform throughout the area concerned, and provision should be made for rectifying any substantial errors which are made in practice. He also asks that the glaring malpractices existing in connection with Russian grain shipments should cease. Such abuses must in the long run be highly unprofitable to the perpetrators, for buyers can take effective means of resenting them. Nevertheless, as the recent history of the grain trade has shown, it would be better for all concerned that such evils should be rectified by the joint action of shippers, merchants and receivers, with or without the co-operation of the Governments concerned.

The following points should be remembered by those wishing to sell wheats on our markets:

1) Bulks should be uniform throughout, and the standard of quality, whatever it may be, should be maintained with a minimum deviation therefrom.

2) Wheats which contain the smallest percentage of dirt, rubbish and other extraneous matter and which yield the highest percentage of good flour with the minimum of risk and trouble to the miller, are those which he prefers. Their virtues have a cash value.

3) Nothing should be done to hide or disguise any imperfections or faults of quality. A miller is more likely to buy wheat of poor quality at a reasonable price than run unknown risks by continuing to buy, except at a very low price, wheat whose real qualities he is unable to recognize or appraise.

4) Ordinarily the colour of the bran is relatively unimportant, but preference should be given to white wheat. In this connection, it should be remembered that white wheats can possess great strength, and red wheats can be very weak, and that a dark skinned wheat can yield a very white high grade flour. Quality of endosperm is one Mendelian unit, colour of skin is another. There is no inevitable correlation between them.

5) If on all other points they are of equal merit, wheats yielding a white flour are superior to those yielding a yellow or dark one.

6) A clear distinction should be drawn between wheats which appear to be hard, merely because the percentage of moisture they contain is low, and those which are really hard by nature, even when their moisture is raised to that of dry English wheat, say to 16 per cent.

7) Wheats, whether inherently hard or mellow, should always be of a "free milling" nature; in other words, it should be possible to obtain with the minimum of trouble and power the desired separation of husk from kernel. A mellow wheat which becomes "woolly" or a hard wheat which becomes "horny" when water is added before or during grinding, cannot be an ideal wheat.

8) The berry should be of average size, neither too short nor too long, neither too big nor too small.

9) Although bulks should contain no stones, dirt, seeds or other extraneous matter, a low percentage of such impurities is not a great objection so long as their size and specific gravity differ substantially from those of wheat. Special care should be taken to exclude aromatic impurities, such as eucalyptus.

10) If the wheat come from a country where it is likely to suffer from the depredations of weevils, it should be of a kind which they do not readily attack, or it should be stored under conditions in which the risk of such damage can be minimised, or it should be exported soon after harvest.

11) If wheat come from a country where it is likely to suffer from an

excess of rain or humidity at harvest time, those varieties should not be grown which are likely to sprout easily.

12) Durum wheats are not likely to realize maximum prices in our markets for flour purposes. The objections against them are much less now than they used to be, but in spite of all improvements in our methods of milling them, they are not so suitable for flour making as wheats of the "ordinary" type. Some varieties of Durum are much superior to others, and if for agricultural reasons it is desirable to grow this type of wheat, many varieties of it should be tested by growers, and those selected for extensive cultivation which suit the producer and are least objectionable to the miller.

13) Wheats which require different methods of cleaning and conditioning as part of the milling process, should neither be grown together nor mixed together before that stage of preparation has been passed. If that recommendation be not observed, the miller cannot develop or utilize to the utmost advantage the potentialities of the wheats so mixed, and cannot be expected to pay maximum prices for them. Therefore, an inherently hard wheat should not be mixed for sale with a naturally mellow one, if the best commercial returns are to be obtained by the producer. For such reasons it is important to discover in very hot countries, to what extent irregularities in the texture of wheat are due to irregularities in water supply, and how by a proper regulation of water in irrigation, or by a proper preparation of soil the supply of moisture to the wheat plant can be made available at the right times. Furthermore, as white bran is not infrequently worth more than red, it is undesirable to grow together or mix before shipment white and red wheats.

14) Nondescript wheats are not of high value. If a wheat be really strong and poor in other respects, or if it yield flour of particularly good colour or flavour and on other points be of poor quality, its one great merit recommends it to buyers, whereas wheats of no outstanding merit on any point are merely "padding" and have no particular value. They can be sold, but at a low price.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

898 – **Regulations governing the Preparation, Sale, Barter, Exchange, Shipment and Importation of Viruses, Serums, Toxins, and Analogous Products intended for Use in the Treatment of Domestic Animals.** – *United States Department of Agriculture, Bureau of Animal Industry*. B. A. I Order 196.

Under authority of the Act of Congress approved March 4, 1913, entitled: An Act making appropriations for the Department of Agriculture for the fiscal year ending June thirtieth, 1904 (37 stat., 832), the following regulations have been made; they are designated as B. A. I. Order 196, and have become effective on July 1, 1913.

No person, firm or corporation shall prepare, sell, barter or exchange, ship or deliver in the district of Columbia or in any territory of the United States or in any place under the jurisdiction of the United States, any virus, serum, toxin or analogous product (antitoxins, vaccines, tuberculins, malleins, microorganisms, killed microorganisms and products of microorganisms) manufactured within the United States unless it shall have been prepared at an establishment holding an unsuspended and unrevoked licence issued by the Secretary of Agriculture,

A licence will be issued only after an inspection of the establishment by a duly authorised officer or employee of the Bureau of Animal Industry, has shown that the condition and equipment of the establishment and the methods of preparation are in conformity with these regulations. Each licence shall terminate at the end of the calendar year during which it is issued, and it shall be reissued only after a new inspection. A licence will be suspended or revoked if it appears that the construction or the management of the establishment is defective, if the methods of preparation are faulty; if the products are advertised or labelled so as to mislead or deceive the purchaser in any particular; if the licence is used to facilitate the preparation, sale etc. of any worthless or harmful product; or if the licence violates or fails to comply with any provision of the of Act of March 4, 1913 or of the regulations made thereunder. The preparation of any virus, serum, toxin or analogous product will not be allowed if put into trade in such a way as to mislead or deceive any one as to their nature. Every separate container of the above substances shall bear the true name of the product and the licence number assigned by the department, as well as a serial number affixed by the licensee for the identification of the product, with the records of its preparation. Each container shall also bear the " return date ".

The importation of the above products will be allowed only to those persons who have obtained a permit from the Bureau of Animal Industry. Each importer of virus, toxin or analogous product shall make application in writing to the Secretary of Agriculture for a permit, such application shall be accompanied by the affidavit of the actual manufacturer produced before an American consular officer stating that the product mentioned is not worthless, contaminated, dangerous or harmful, and if it is derived from animals, that such animals have not been exposed to any infectious or contagious disease, except as may be essential in the preparation of the product and as specified in the affidavit.

Each application for a permit shall be accompained by the written consent of the actual manufacturer that properly accredited officers and agents of the Department of Agriculture shall have the privilege of inspecting without previous notification all parts of the establishment at which such products are prepared.

Each permit shall terminate at the end of the calendar year during which it is issued.

The persons duly authorized by the Department of Agriculture to inspect establishments in which viruses and such products are prepared, shall be permitted to inspect the entire premises and all the equipment, such as chemicals, instruments, apparatus, etc. as well as the methods used in the preparation, handling and distribution of the said products.

No machinery, molds, instruments, tables or other apparatus which come in contact with virulent or attenuated microorganisms or toxins shall be used in the preparation of other forms of biological products.

All equipment, containers, machinery used in the preparation of viruses etc. shall be thoroughly sterilized before use.

Each licensed establishment shall keep permanent detailed records of the methods of preparation, of the sources of bacterial cultures, of the virulence of such cultures. of the methods of testing purity and potency of each product, together with the methods of preservation.

The stables used for experiment animals shall be in good sanitary conditions. Animals infected with, or exposed to disease shall be properly segregated, and all instruments, containers and other apparatus, shall be thoroughly cleaned and sterilized before use. Establishments shall be so located as to avoid the spread of disease. and suitable arrangements shall be made for the disposal of all refuse.

Viruses, toxins and analogous products shall be stored in cold chambers or refrigerators both by the manufactures and by the dealers.

The immunity unit for measuring the strength of tetanus antitoxin shall be 10 times the least quantity of antitetanic serum necessary to save the life of a 350 gram guinea pig for 96 hours against the official test dose furnished by the Hygienic Laboratory of the United States Public Health Service.

The number of immunity units recommended for the prevention of tetanus in a horse shall be at least 500 units.

899 - **Decrees Establishing Experimental Stations for the Investigation of *Manihot* and *Hancornia speciosa* in the States of Bahia, Piauhy and Minas Geraes, Brazil.** — *Diario Official, Estados Unidos do Brazil*, Year LII, No. 56, pp. 3553-3565. Rio de Janeiro, March 9 1913.

By the decrees Nos. 10053, 10054 and 10055 of February 14, 1913, experimental stations are to be established in the states of Bahia, Piauhy and Minas Geraes respectively for the culture of *Manihot* and *Hancornia speciosa*. The purpose of the stations is the experimental investigation of all the factors related to the culture of the principal species of *Manihot* (*Glaziovii, dichotoma, heptaphylla, Piauhyensis*) and of the principal varieties of *Hancornia speciosa*, in order to determine which are best adapted to certain soils and to provide information and complete data to agriculturists and others interested in the subject as to the necessary methods and processes. to be adopted for the production of rubber in those regions on the most up-to-date and economical lines. Further, investigations will also be undertaken with regard to food plants and stock breeding which might prove useful adjuncts to the plantations.

900 - **Grants for the Development of Agricultural Education in the Argentine.** — *Boletin oficial de la República Argentina*, Year, XXI, No. 5789, pp, 911-912. Buenos-Aires, April 21, 1912.

The presidential decrees of March 28th, 29th, and 31st, 1913, have authorized the following expenditure:

	£
For the founding and carrying on of the « Escuela de Agricultura de 25 Mayo «	2 473
For the founding and carrying on of the « Escuela de Mecanica agricola » at Bahía Blanca	1 595
For the founding and carrying on of the « Escuela de Agricoltura » of the Tigre	4 963
For building and working a model workshop at the Tucuman school	1 637
For purchase of laboratory material for the above schools	3 019
For erecting buildings for agricultural schools	48 862

VELOPMENT
AGRICUL-
RE IN
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UNTRIES.

901 - **Agriculture in Russia**, — HITIER, M. H. in *Société Centrale d'Agriculture du Département de la Seine-Inférieure*, Year 153, New Series, No. 21, pp. 62-93. Rouen, 1913.

European Russia forms an extensive plain, which at no point from the Black Sea to the White Sea or from the Carpathians to the Urals, attains a height of 300 m. (1000 ft.) above sea-level. Its climate is markedly continental and is characterized by great differences of temperature in winter and summer, a rapid transition from the hot to the cold season and *vice versa*.

The vegetative period is unusually short, so that, in spring especially, the time and labour available for preparing the fields are scarcely sufficient. The annual rainfall (St. Petersburg 504 mm. 19.8 ins), Moscow and Riga 541 mm. 21.3 ins), Warsaw 561 mm. (22.1 ins.) is adequate on the whole, but is very irregularly distributed among the different periods of the year. The present scarcity of food in Russia is due, not to absolute want of rain, but to its deficiency at the times when the crops are just coming up, namely August and September for winter crops and April and May for summer crops.

With regard to the various types of soil and their cultivation, four different regions can be distinguished in Russia passing from north to south: the tundras, the forest region, the black soil region and the dry steppe.

In the tundra zone, which occupies the northern halves of the Government of Archangel and of Finland, lichens and mosses predominate and only in sheltered spots are occasional willows, spruces and dwarf birches to be found.

In the forest region extending southwards to the middle of the Governments of Kazan, Nizhnii Novgorod, Ryazan, Tula, Orel, Kiev and Podolia, the winter lasts for 8 or 9 months. In this zone, which was formerly completely wooded, the burning-off system is practised in many places. This method of cultivation is, however, gradually disappearing, and particularly in the south of this region is being increasingly replaced by the three field system, and even by a six or eight year rotation with seed-leys (clover and timothy). Here with the exception of the sugar-beet district, agriculture, cattle-breeding and agricultural industries are the furthest advanced. In addition to large quantities of farmyard manure, chemical manures are increasingly used. Flax is the chief crop grown.

Bordering the forest region throughout its whole southern extent is the black soil region which occupies between 250 000 and 280 000 sq. miles. The cold and warm seasons of the year are here of about equal length. The three-field system is exclusively practised. The rich soil is never manured, at all events on peasant properties, and in many districts, especially in the south, cereals are grown year after year. While only 40 per cent. of the forest region is arable land, the latter occupies 70 or 80 per cent. of the black soil area, owing to the extensive cereal cultivation.

In the south, this productive zone passes gradually into the dry steppe region, and into the zone of the nomads and herdsmen, which further on borders the salt steppes of the Caspian Sea.

After the freeing of the serfs in Russia in 1861 the curious form of collective ownership obtaining in the peasant communities (Mir) hindered agricultural progress. Since 1906 the Agrarian Commission has been engaged in converting the collective property of the communes into the private property of the peasants (1).

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(1) For the reorganisation of agricultural land tenure in Russia, see No. 736, *B.* June 1013. (*Ed.*).

The total area of European Russia (exclusive of Poland and the areas occupied by lakes and rivers) is 1 944 726 sq. miles which in 1910 were divided as follows :

	acres
Forest	408 584 576
Cultivated land	497 545 319
Wheat	61 210 990
Barley	26 451 477
Oats	39 953 067
Rye	63 416 065
Maize	3 638 348
Millet	7 496 683
Potatoes	8 243 382
Buckwheat	4 933 391
Flax	3 566 642
Hemp	1 801 893
Natural meadows and pastures	66 327 847

Hitherto, rye has taken the first place among the cereals. For the last ten years, however, its cultivation has not extended, but has rather shown a tendency to decrease. In 1910, 674 508 tons were exported, valued at £ 3 200 000.

The area under wheat increased from 47 000 000 acres in 1901 to 62 000 000 acres in 1911. Russia is now the chief wheat-exporting country in the world; her exports were 5 128 764 tons in 1909 and 6 178 767 tons in 1910, while in 1910, the United States exported 2 760 000 tons, Argentina 1 970 000 tons, Canada 1 400 000 tons, British India 1 200 000 tons and Rumania 1 900 000 tons.

The area under barley has steadily increased during the last 10 years : in 1910 about 4 000 000 tons were exported.

The total exports of wheat, rye, barley and oats in 1910 amounted to 129 824 000 tons with a value of £ 70 099 016.

Russia is without doubt the chief flax producing country. The areas and yields for this crop were :

	Area in acres			Total yield in tons 1911	Yield cwts. p. acre
	1912	1911			
In European Russia	3 467 295	3 428 694	Seed	513 592	3,1
			Fibre	461 424	2,8
Asiatic Russia	227 770	279 544	Seed	22 168	1,6
			Fibre	21 700	1,6

The amount of flax exported shows a tendency to decrease and this is due partly to the increased demand for the raw product in the home factories and partly to the fact that sugar beet is taking the place of flax. In 1910, Russia possessed 1 648 216 acres of sugar beet fields and these had increased to 1 944 746 acres in 1911, while its sugar production amounted last year to 1 993 990 tons. On many estates from 8 to 8.7 tons of beets are produced per acre, but the crops, expecially on the peasant properties could be greatly increased by the more liberal use of chemical fertilizers.

On July 1, 1912 the numbers of live stock in European Russian were as follows :

Horses	23 860 178
Cattle	34 547 348
Sheep and goats	42 735 567
Pigs	11 944 568

The number of animals exported from Russia is relatively inconsiderable, but the export of animal products is assuming ever-increasing importance. In 1898, 10 120 tons of butter worth £688 064 were exported while in 1907, 56 758 tons were exported, valued at £4 933 400. Most of the exported butter goes to Great Britain, Germany and Denmark. Russia exports annually poultry (especially live and dead geese) to the value of about £1 680 000 and in 1910, nearly three thousand millions of eggs, worth £6 680 800 were exported.

In spite of the great progress which agriculture has already made in Russia, and which is not manifested so much by increased crops per unit area, as by the extension of the cultivated area, it has not yet reached the limits of the natural resources of the country. But the gradual adoption of better and more intensive methods of cultivation, the growing use of chemical fertilizers, the development of the home agricultural machine industry together with increased imports of foreign implements and especially the all important reorganisation of agricultural land tenure, indicate that the production per unit area will shortly be raised.

902 – **The Agricultural District of Groningen, Holland.** — Verrijn Stuart, C. A. in *Landwirtschaftliche Jahrbrücher*, Vol. 45, Part 3, pp. 519-528. Berlin, May 3, 1913.

A review of the historical development of agriculture (cereal and sugar-beet cultivation), of moor cultivation (peat-cutting and potato-growing), and of the industries connected with agriculture (the manufacture of potato meal and cardboard made from straw) in the Groningen district.

RURAL HYGIENE

903 – **The Eradication of Mosquitoes by the Cultivation of Bats.** — *Communication to the International Institute of Agriculture by* Dr. Chas. A. R. Campbell, San Antonio, Texas.

The writer begins by a brief review of the discoveries made concerning the plasmodia of malarial fever, he then describes how the mosquitoes inoculate their living poison into its human host, and communicates the results of an enquiry made by him by means of hundreds of letters addressed to health officers and druggists in different parts of the Union, in order to ascertain the existence of malaria in the several States. He quotes Dr. L. O. Howard, Chief Entomologist of the United States Department of Agriculture who very conservatively estimates the tribute that that Nation pays to malaria at one hundred million dollars yearly.

The greatest enemy of the mosquito, according to the writer, is the bat. For the cultivation and propagation of this animal the writer has devised a kind of wooden tower or roost (see fig. 2) which offers the advantage of preventing bats, who are obliged usually to fly long distances from their caves in search of food, remaining continuously on the wing for ten and twelve hours at a time, from continually seeking new quarters.

Besides the well known means of defence which the bat possesses against its enemies *viz* its nocturnal habits, its propensity for hiding in dark places during the day, its facility of compressing its body into small apertures, there is the character of the hair covering its body. This last feature is considered by the writer to be a protection against the stings of the Anopheles which during the day also inhabit the same dark places. This protection appears to be due to the peculiar formation of the hair, which is not a round and smooth shaft. but is similar in form to a number of Morning-glory flowers strung on a straw, with the edges of the flowers, terminating in points with the bells outward. Possibly the odour of the bat also serves to protect it from mosquitoes. That bats are most remarkably free from disease is evidenced by the fact that they live in caves by the million, hang touching one another, and even to one another in huge bunches, yet people engaged in the business of gathering guano from caves very rarely find a dead bat.

That mosquitoes form the chief diet of bats is certain, ninety per cent being a conservative estimate. The character and arrangement of its teeth clearly show it to be carnivorous. It will eat pieces out of hams and bacon left in smoke houses. The character of the bites show the pieces to have been torn out, instead of being gnawed, as would be the case, if gnawed by some rodent. The mosquito being a blood-sucking insect, furnishes the bat with an ideal carnivorous diet.

Knowing of a hunter's small cabin some ten miles from San Antonio, where bats were congregating, I procured two large white sheets and spread them on the floor of the cabin about four o'clock in the morning, and awaited their coming. I had however stuffed the roosting places in the hut with rags so they could not roost out of range of the area of the sheets. I watched carefully and counted the proper number going in, and verified the count from the inside of the cabin. I then left them and returned in the evening to count them again when they flew out; after counting the same number going out as came in, I very carefully collected the pieces of guano on the sheets, put them in a little box, and again spread out the sheets to continue the experiment the next day. This was done three times consecutively, and the result is that it averages twenty-six (26) pieces of guano to each bat. These observations were made in the month of November, purposely selected on account of the food of the bats being about at a minimum at this time.

Having acertained approximately how many times a day a bat dropped guano I took one dropping or single piece of guano and macerated it in peroxide of hydrogen for several days. The peroxide dissolves the oxidized and concreted mucus which holds the mass of guano together. I then filtered this through ordinary filter paper the weight of which I had previously ascertained, and found the residuum to contain principally the comminuted skeletons of mosquitoes; the proboscis, the heads, eyes,

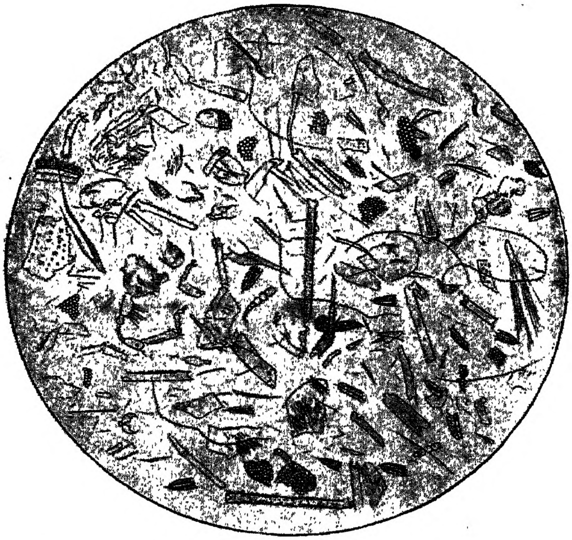

Fig. 1. — Bat Guano; Showing Skeletal Remains of Insects, principaly Mosquitoes.

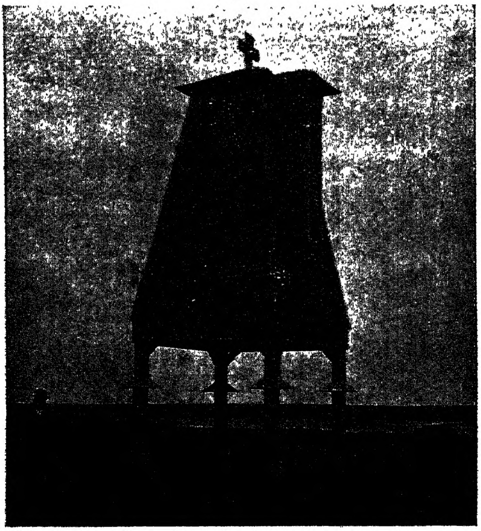

Fig. 2 — Dr. Campbell's Hygiostatic Guano - Producing Bat Roost.

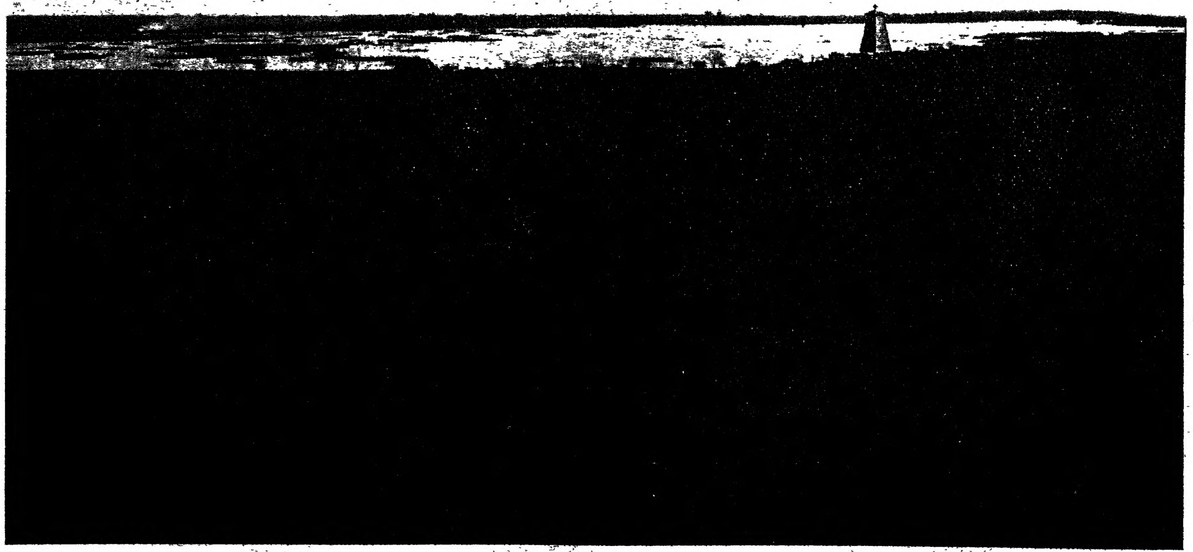

Fig. 3. — Model Bat Roost, Showing Large Extent of Standing Polluted Water.

thoraces, abdomens, legs, wings and scales of mosquitoes (See fig. 1). The external body or shell of mosquitoes being of a horny substance known as chitin, affords the bat no nutrition being entirely insoluble, hence passes through the alimentary canal as fecal debris. The contents of the head and in fact all internal organs are digested. The weight of this filtered residue of one bat dropping, was approximately 1/25 of a grain (1).

This much of the work is purely scientific, but it demonstrates the enormous value of these usually despised creatures. I was content with having done this much, and would have considered the work concluded, had it not occured to me, to weigh the twenty-six pieces of guano.

Twenty-six pieces of guano toward the end of the season, when insect life is at a minimum, weigh two and three-fifths grains; the bat in this climate is active from about Feb. 16 to as late as Dec. 15, depending on the season.

In order to be very conservative in estimating the value of the guano, we will calculate only on eight months, namely from the middle of March to the middle of December.

Commercial value of one bat roost at estimated capacity of 500.000 *bats.* — Twenty-six pieces of guano. which are the droppings of one bat per day, weigh two and three fifths (2.3/5) grains, which equals seventy eight (78) grains per month, or, six hundred and twenty-four (624) grains per bat in eight months. 500 000 bats drop in the same time 624 times 500 000 = 312 000 000 grains, or more than 20 1/4 tons; at 30.00 dollars per ton, equals $607.50. A structure large enough to hold 500 000 bats would cost, figuring long, about $1200; now let us treat this estimate just as we did the hygienic, deduct 50 %; I think we could well afford to deduct 50 % again from that, and still leave a nice margin of income, on the investment.

In the beginning of this writing, it suggested that the bat ought to be provided with a home, in order that we might take advantage of its wonderful habits, and the photograph shown and marked " Dr. Campbell's Hygiostatic Guano-Producing Bat Roost" represents such a structure in actual existence — though intended only as a working model for demonstration. It has proved itself more than a model. The Roost stands ten feet above the ground, and the structure itself, twenty-feet above that, is twelve feet at the base, and six at the apex. It is given that steeple shape, and placed above ground for several reasons: Its shape makes it resistant to high winds and the elevation from the ground acts as a wind break, and allows the supporting posts to be fitted with contrivances to prevent the bat's enemies, from gaining access to the Roost, also a wagon to be driven underneath at the base, which is provided with a hopper on hinges and which opens downward, enabling the guano to be easily collected.

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(1) Basing his calculations on the analyses of one hundred dried mosquitoes, the writer comes to the conclusion that each of the droppings of a bat contains the skeletal remains of ten mosquitoes, and as a bat drops upwards of 50 pieces of guano a day he considers the number of mosquitoes destroyed by each bat to be above 500 per diem. He further assumes that there are at least five hundred thousand bats per roost.

The defense which this structure affords the bat from its natural enemies is of great importance. These enemies are coons (*Procyon lotor*) opossums, wild-cats, skunks, civet-cats (*Viverra civetta*) and chicken snakes (*Coluber quadrivittatus*). It is during the breeding season, that the bat suffers most from its natural enemies. Shortly after the young are born, they cling mechanically to the mother's body, and very often loosen their hold, and fall to the bottom of the cave, only to become a prey to some of the aforementioned wild animals, who seek bat caves at this particular season. The mother bat darts down after her young and she also falls a victim to that most noble of characteristics, maternal instinct. These features of protection, and freedom from molestation, will cause the bats to increase so rapidly, that the capacity of the Roost will be soon taxed, especially if it be erected in some quiet place, some distance from human habitations.

This bat Roost I erected at the head of a large body of standing water, ten miles south of the city of San Antonio. The inner construction (which is of course the most vital) is based on lines, after long and most careful study, entirely in harmony with their most singular habits. The louvered window seen on the outside, forms the entrance and exit for the bats. A red cross on the apex ol the roof, designates it as a hygienic measure. In choosing the location for the erection of this Roost, it might be well to mention that it was selected because conditions and environments in the vicinity of its location could not be more ideal for the breeding of mosquitoes. Into this large body of water, hnown as Mitchell's Lake, flows the sewage of San Antonio, averging 10.000.000 gallons per day, the extent of territory covered by this lake, is estimated by its owners at 900 acres. It never overflows, as the water is used for irrigation, some by gravity, and some by pumping. The huge amount of organic matter in the water, the large pools formed both by irrigation on the land, and water left in the laterals. the receeding water in the lake left when used largely, the large pools formed by seepage through earthen dams, outside of the main body of the lake, are the existing conditions, and I am sure that no more exacting demands could be put to the value of bats as destroyers of mosquitoes, than such environments. No swamp in the low lands is worse.

The Roost was finished on April 2, 1911. Before locking the louvre, I sprayed the inside with a chemical fluid giving off an odor identical to the natural odor of the bat, and spread twenty-five pounds of *fresh* guano, in the hopper at the bottom of the Roost.

On Aug. 4, 1911, or about four months later, it became tenanted by a colony of bats attracted there by the odor, that I estimated at several hundred, from the fact that it took them flying in one constant stream, fully twenty minutes. The next year, 1912, the Roost became so thickly stocked, that it took them several hours to come out; they came out in clouds. This feature conclusively demonstrates the fact, that bats can be colonized. There are other features employed in the colonization of these creatures, and these require time and labor, but one is amply rewarded in the end.

When these little " bird animals " once become accustomed to a place, they never leave it except at night to feed and always return in the morning. During the spring of 1910 and 1911, in studying the period of gestation in bats, I had occasion to catch a great many from an old building and as I could only use the females, I marked every male bat by cutting a tiny " v,, on the right ear, and liberating them from my work room, some three miles from the old building. In a week's time, when I again caught a large number from the same place; I would invariably catch some of the same ones again; and in many istances, for the third tine, evidenced by the different markings.

It might be said that this vicinity is better favored for the cultivation of bats than others. The ansver is very simple. Of coarse there are more bats in the neighborhood of hills and mountains, than in low lands and swamps because caves are their normal homes, and these are found in hilly and mountainous regions, but the fact remains, that they can be colonized, and on just such a territory as desired. There are bats in every city, town or village in the world, because the geographical range of that creature, whether of one species or another, like its principal food, extends from Alaska to Patagonia on this hemisphere, and the same holds good on the other half of the world. The Roosts must be built, as said before, entirely in harmony with their habits, or it will prove a failure, as I know from actual experience in building the first Roost.

The Practical Hygienic and Commercial Results. — A few days ago I made a personal canvas to every family living on the east side of the Lake. I spoke to the heads of 14 families, and each one declared to me, that the mosquitoes last year were very much less, than the year before. They also declared that chills had almost vanished. To a man they had become friends of the bat, and they instructed their children never to kill one.

One of the more prosperous tenants, pointed out to me a sleek looking herd of work animals as the best evidence of the scarcity of mosquitoes; he said that during 1910 and 1911 his stock was very thin notwithstanding being well fed, and he was certain the emaciation was due to anemia caused by depletion on the part of the mosquitoes. Several others said that in the same years they were at times driven from the work of irrigating at night, by the myriads of mosquitoes on the lake. Last year 1912, they scarcely bothered them.

One of the tenants said he had often awakened at night, and found what he thought were hundreds of bats flying about in his cottage, all doors being open on account of the heat; knowing them to be in quest of mosquitoes, he never molested them, neither did the mosquitoes molest him, after the bats left. A prominent San Antonio business man who frequently goes duck-hunting on this lake was very much surprised last year, when he found he was not molested by mosquitoes when remaining in the blinds rather late towards evening, in quest of game,

As it becomes essentially necessary that these creatures be not disturbed for some time after finding a new home, I did not go very near the Roost, nor allow any one within the enclosed acre. On Dec. 18, 1912 after a cold snap, I opened the Roost for the first time, and found between four and five hundred pounds of guano had accumulated in the hopper. A sample shows the following chemical analysis:

Moisture	10.70	per cent
Water soluable phosphoric acid	1.00	»
Citrate soluble phosphoric acid	0.35	»
Citrate insoluble phosphoric acid	0.10	»
Total phosphoric acid	1.45	»
Available phosphoric acid	1.35	»
Nitrogen	11.76	»
Ammonia	14.26	»
Potash	0.98	»

As to bats and guano as a commercial proposition, I quote a letter from Mr. Robert P. Marbach. Bracken, Texas, who deals in guano:

“ I work two bat caves, one 19 miles from Sabinal on the South Pacific Rail-road, the other, seven miles from here (Bracken). They are known as the Frio cave and the Cibolo cave. The Frio cave is very large and yields about 60 tons annually, but I loose about 20 tons on account of its enormous size and colossal boulders, which prevent gathering all of the deposit. The Cibolo cave yields on an average seventy-five tons annually; it is much smaller than the Frio cave, but the bats are not so scattered, and I have a smaller area to work. I have however the same trouble in this cave that I do in the other, viz. large rocks which prevent me from gathering the entire deposit. I calculate that I loose in this cave, about one car-load. However in a wet year, when all water-holes are full, and there is plenty of water, I count on a heavy car-load more from each cave.

“ This business was handed down to me by my father, who controlled it for many years. I am supplying his customers, and ship large quantities to Crystal Springs, Jackson and Hazelhurst Miss., though the entire crop of my Cibolo cave I shipped to Laredo, Texas on account of an extensive onion industry which has developed there. I get thirty dollars a ton for my product, put in sacks of about 100 pounds ,,.

In conclusion and as resumé of this work, let me again revert to a few facts:

1. — That the mosquito is unquestionably one of man's most formidable enemies, not only “per se” but also by the subtle role he plays in transmitting disease-producing bacteria.

2. — That the mosquito may be considered as a good food for the bat.

3. — That we can build a home for the bat where it will be protected from his enemies, and propagate in countless numbers, at the same time protecting us, by improving our hygienic conditions.

4. — That the commercial feature in the propagation of bats will insure its adoption, the hygienic benefits that follow will protect the community in which they are erected, especially the poorer classes who know nothing of the dangers of mosquitoes or the use of screens, and amongst whom we find the most sickness.

5. — That when we propagate this most useful creature, he not only destroys the disease-producing mosquito that serves it as food, but it actually converts that most malevolent of insects into a high grade fertilizer.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

904 - **The Work of the "Landes-Kulturrat" of Lower Austria in the Promotion of Dairy Farming.** - SABATINI, P. in *Landes Amtsblatt des Erzherzogtums Oesterreich u. d. Enns*, Year 9, No. 11, pp. 21-28. Vienna, June 1, 1913.

During the last three years, the "Landes-kulturrat" of Lower Austria has held a series of courses for the promotion of dairy farming, and has also given assistance in the purchase of dairy machines and apparatus, as well as making grants to different associations. The courses are divided according to the subjects dealt with, into classes for "coolers" managers and milkers.

The "coolers" are the men employed by milk-supply associations in the collection, examination, cooling and dispatch of milk; in their course, instruction is given in the principles of the dairy industry, special stress being laid upon the practical handling of the milk and upon milk control on a scientific basis. The courses are always held in the same place, where the necessary rooms, machines and cow-sheds are at the disposal of the students. This course lasts for 12 days; at the end a theoretical and practical examination is held. From November 1910 till April 1913, 11 coolers' classes were held and they were attended by 114 persons. The whole cost of these courses (without teaching material) amounted to £348; this was defrayed by the "Landes-kulturrat"

The object of the managers' course is to instruct the managers of the associations in superintending the work of their subordinates and teach them how to deal with possible suggestions and justified observations. The subjects of instruction are otherwise the same as those of the coolers' course. So far five of these course have been held, attended by 47 persons. The total expenses were just over £59.

The object of the milkers course is to give, especially to the sons of farmers, an opportunity of learning the theory and technique of systematic milking. The course, however, is not confined to this subject, but also includes the whole field of systematic dairy-cow keeping and treatment. The course lasts one month. Besides the specialist and the dairy instructor, who give the classes for coolers and managers, some of the milkers' classes are also taken by a vet. The course terminates with a theoretical and practical examination, but after some months, during which the students have to practise what thay have learnt, a second and entirely practical examination is held; it is on the results of this that the diploma is granted to the successful candidates. So far, the "Landes-kulturrat" has held five of these milkers' courses, which were attended by 47 persons. The total expenses amounted to nearly £452.

905 – **The Live Stock Institute at Louvain in Belgium.** — FRATEUR, J. L. Note sur l'Institut de Zootechnie de Louvain. *Ministère de l'Agriculture et des Travaux publics, Office rural, Rapports et Communications*, No. 5, pp. 81-85. Brussels, 1913.

The Live Stock Institute at Louvain was founded in 1908 for the purpose of the scientific study of all the problems connected with animal breeding. It also affords opportunities to students of the Agricultural section of the University to further prosecute their studies in this direction. The writer describes the building and its arrangements and also gives an account of some of the experiments which have already been made, or are in progress. In order to test, in a practical manner, the results of these experiments, the Institute is in connection with the agents managing the estates of charitable institutions, and with well-known breeders.

Attached to the Institute is an information bureau, which in 1912 sent out over 80 letters giving advice.

906 – **New Regulations regarding the Admission of Regular Students to the Milan Agricultural College.** — *Gazzetta Ufficiale del Regno d'Italia*, Year 1913, No. 102, p. 2545. Rome, May 2, 1913.

A royal decree of April 6, 1913, states that any person wishing to enter the Milan Agricultural College as a regular student must, in future, possess a certificate showing that he has passed the final examinations at a "Liceo" or "Istituto tecnico" (1) or else have a leaving-certificate of the higher course at the Schools for Wine-Making.

RICULTURAL OWS AND NGRESSES

907 – **Agricultural Shows.**

Algeria

1913. September 5-7 - Batua. Live Stock Show (Cattle, Sheep, Horses) organized by the Agricultural Society (comice) of the town.

Australia: New South Wales

1914. January 14-15. — Show of the "Albion Park A., H. and I. Association" M. A. Brown, Secretary.

January 23-26. — Show of the "Kiama A. Association" G. A. Somerville, Secretary.

March 3-5. — Show of the "Uralla A. Association" H. W. Vincent. Secretary.

April 1-3. — Show of the "Upper Hunter P. and A. Association". Muswellbrook. R. C. Sawkins, Secretary.

April 7-15. — Sydney. Show of the "Royal Agricultural Society". H. M. Somer, Secretary.

Australia: Victoria

1913. September 22-27. — Melborne Show of the "Royal Agricultural Society of Victoria".

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(1) These about correspond to the matriculation examination of London University; the "Liceo" is the highest school with classical education, and the "Istituto tecnico" the corresponding stage in technical education, (*Ed.*).

Austria

1913. August 9-12. — Komotau. Agricultural Show and Twelfth General Meeting of the Beekeepers of German Bohemia.

Belgium

1913. August 9-18. — Ghent. Flower and Horticultural Show organized by the van Houtte Club.

September 6-9. Louvain. International Poultry Show, organized by the Poultry Association of the District of Louvain, under the patronage of the National Federation, of the Municipality and of the Agricultural Comice. For information apply to 21 Rue des Pénitentes, Louvain.

September 16. — Sibret — Show of potato-lifting machines.

September 23-27. — De Chassart Estate. Show of mechanical tractors and tilling machines, organized by the Ministry of the Belgian Colonies, with the object of generalizing the use of mechanical tillage in the Belgian Congo. £ 3600 will be given in prizes. The best machines will be bought for the Belgian Congo Colony or will be awarded an indemnity to defray part of the expenses incurred by the exhibitor in taking part in the trials. Entries close on Septemper 1. For information address: Directeur Général de l'Agriculture au Ministère des Colonies, 7 Rue Thérésienne. Brussels.

December 14-15. — Mont-sur-Marchienne. National Poultry Show, organized by the Poultry and Rabbit Club of the Town. Address: Léopold Germain, place du Vez, Mont-sur-Marchienne.

1914. February 7-9. — Iseghem. Fourth International Poultry Show organized by the Hoenderboud't Neerhof. V. Laridon, Secretary, Café Royal, Iseghem.

Canada

1913. September 15-20. — Fredericton, New-Brunswick. Agricultural and Industrial biennial Show and Fair open to the whole Dominion of Canada and to the State of Maine for Live Stock, Poultry and Agriculture in General; The Industrial Section is open to all. Total of Prizes for Live stock and Agricultural Show. £ 3108; Medals and Diplomas for the Industrial Show. For Information apply to W. S. Hooper, Secretary, Box 150, Fredericton, New Brunswick, Canada.

France.

1913. August 9-10. — Perpignan (Pyrénées orientales). Catalan Horticultural Fêtes for the Thirtieth Anniversary of the Roussillon Horticultural Syndicate.. Horticultural Fêtes. Garden Competition, General Exhibition of Horticultural Material and Production. Trials of Processes, Material and Machines used in Horticulture. Poultry and Bee Show. Address: Seat of Horticultural Syndicate, Café Garand, Avenue de la Pepinière, Perpignan.

Saint-Julien (Haute Savoie). — Competition for the Construction of Cheese Dairies. — The Agricultural Comice of the District of Saint-Julien-en Genevois (Haute-Savoie) organizes a competition for the construction of cheese dairies with pigsties attached, the competition is open to all who take an interest in the subject. The plans must be sent in before September 1, 1913 to l'Ingénieur des améliorations agricoles, 46 Boulevard des Brotteaux, Lyons. The prizes will be awarded at the same time that the Show of the District Agricultural Comice of Saint-Julien-en-Genevois will be held at Annemasse, namely September 7. 1913. For information apply to M. Maitrol, Ingénieur des Améliorations Agricoles, 46 Boulevard des Brotteaux. Lyons. or to M. Guilhermet, Professor of agriculture at Saint-Julien-en Genevois.

September 5-6. — Rive de-Gier (Loire), Show organized by the Agricultural Society of the Department de la Loire. Entries up to August 25. Apply to J. Biron, Secretary-general of the Society, 27 Rue Saint Jean, Saint Etienne.

September 5-7. — Castres, Tarn. Departmental Show of Stock breeding, Agriculture, Vine-growing, Horticulture and Packing Material, and Test of Agricultural Machinery and Implements organized by the Agricultural Comices of Albi, Brassac, Castres, Gailhac, Lavaur, Mazamet.

September 13-14. — Montbéliard, Agricultural Show organized by the Agricultural Society of Doubs.

September 22-28. — Auray. Show of Brittany Draught Horses and Nags for the Artillery, of Spotted Black Brittany Cattle, Brittany Pigs, Poultry, Bees and Horticulture etc., organized by the Morbihan Agricultural Society. For information: M. Petit, Directeur des Services agricoles à Vannes.

October 3-5. Laval. — Annual Mayenne Departmental Show.

November 6-10. Pau. — Exhibition of Horticulture and Viticulture, organized by the Agricultural and Viticultural Society of Pau. Address: M. Y. Pomès, Secretary of the Society at Pau (Basses-Pyrénées)

December, Douai. — National Poultry Show organized by the Club of Amateur Agriculturists and Breeders of the Douais district. Apply to M. E. Mathieu, Secretary general, at Roost-Warendin (Nord).

1914. March. Nice. — Great Agricultural and Horticultural Exhibition.

1916. Paris. — International Colonial Exhibition.

Germany.

1913. September 4.5. Ülzen. — District Live Stock and Agricultural Exhibition.

September 6-7. Altena, Westphalia — International Rabbit Exhibition, organized by the "Rasse Kaninchenzuchter Verband" for Altena. For information apply to Herr Karl Storch, Rasse-K-Z-V. Altena.

September 6-8. Laufen Live Stock Show of the District.

September 6-11. Mayence. — Twentyseventh Congress of German Vine-growers, with attached Exhibition of Wines and Apparatus and Utensils used in Viticulture and in Wine-making, with Special Scientific Section (Control of Vine Pests; Protection of Birds, etc.) apply to President of Committee: Herr Gündert at Mayence, Stadthans.

September 7-9. Neustadt (Duchy of Coburg) Exhibition of Animal Husbandry, Agricultural Produce, Machines etc.

September 12-14. Wesel. Agricultural Exhibition, organized by the Association for the Development of the Breeding of the Red Spotted and Black Spotted Races of the Lower Rhine (Zuchtverband I zur Hebung der Rindviehzucht (Niederrheinisches Rot- und Schwartz buntes Vieh), by the Horse-breeders of the Ree district (Pferde Zuchtverein des Kreises Rees), and by the local Section of the same Association.

September 20-20. Enger (Westphalia). — Live Stock Agricultural Produce and Machines and Implement Show.

September 27-28. Morbach (Rhine Province). — Agricultural Show.

November 1-4. Offenbach. — Sixth Hessian Poultry Show.

November 15-17. Bretzenheim (Mayence) Twelfth Young Poultry Show organized by the Hessian Rhenish Association (Rhein hessischer Verband).

November 29-30. Kiel. — Poultry Show.

1914. Spring. Berlin — Special Exhibition of the Leather Belting Industry organized by the Union of the German Leather Belting Manufacturers (Verband der Ledertreibriemen Fabrikanten Deutschands E. V.) and held at the same time as the general yearly meeting of the Union.

1914. June 25-30. Hannover. — Exhibition of the German Agricultural Association (Deutsche Landwirtschaftsgesellschaft).

Hungary.

1913. September 12-14 Budapest. — Second District Draught Horse Show.

Italy.

1913. Brusegana (Padua) Royal Practical School of Agriculture. — National Competition of Maize Esiccators, organized by the Padua Provincial Commission for the Control of Pellagra. Amount of Prizes offered £ 120.

September. Motta di Livenza (Treviso). — Agricultural and Live Stock Show.

September. Milan, Villa Reale.— Exhibition of Table Grapes and of Non-alcoholic Grape Products in Connection with the Fourteenth International Antialcohol Congress.

September. October. Rovato (Province of Brescia). — Agricultural and Industrial Show, Address to the President of the Executive Committee, Sig. Verzeletti, Rovato.

Florence. Prize Competition for Plans of Rural Buildings, organized by the Agricultural Comice of Florence. Entries received up to October 30, 1913. Apply to the Seat of the Comice, 8 Piazza Signoria. Florence.

1914. April 15-30. Rome. — Second Exhibition of Agricultural Novelties with Special Exhibitions of the Roman Campagna, of the Womens' Section, and of the Italian Colonies, organized by the Association of Italian Agriculturists. Apply to the Seat of the Association, 8 Via XX Settembre, Rome.

Spain.

1913. September, Bilbao. — Live Stock and Machine Show for the Provinces of Vascongadas, Navarre, Santander, Asturias, Burgos and Logrõno, organized by the " Ayuntamento " of the Town.

Switzerland.

1913. August 27-29 Ostermündigen. — Sixteenth Bull Show and Market, organized by the Swiss Federation of Breeding Syndicates of the Red Spotted Breed. For information apply to M. G. Luthy at Zollikofen (Berne).

1915. September. Geneva. — International Horticultural Show with Special Competitions organized by the Geneva Horticultural Society.

Tunis.

1914. April. Tunis — Motoculture Exhibition, organized by the general Direction of Agriculture, Commerce and Colonisation at the request of the Chamber of Agriculture du Nord.

United Kingdom.

1913. September 24-25 Kendal, Market Hall. Annual Exhibition of Honey, Wax and Beekeeping Appliances, organized by the Cumberland and Westmoreland Bee Keepers' Association, and held at the same time as the Congress of the Fruit Growers of the Northern Counties. Apply to G. W. Avery Wetheral, Carlisle, or to Geo. Chatham, Low Green, Stavely, Kendal.

United States.

1915. January 1. — December 31. San Diego, California. — International Exhibition of the Methods of Production.

908 - **Congresses.**

Austria.

1913. September 21-28. Vienna. — Eighty-fifth Meeting of German Naturalists and Medical Men. One section is devoted to Agricultural Chemistry and to Agricultural Experimentation.

1914. Vienna. — Twelfth International Assembly of the Chemists of the Leather Industry.

Belgium.

1913. September 8-9. Ghent. — Fifty-fourth Pomological Congress of France, under the patronage of the Royal Society of Agriculture and Botany.

Szptember. Ghent. — The International Congress of Horticulture has been postponed to the month of September. Address the Secretary's Office : 79 Avenue Chazal, Brussels.

France.

1913. August 20-24. Clermont-Ferrand. — Seventh Congress of Agricultural Cooperation and Mutual Help. Apply to Clermont-Ferrand, 5 Rue de la Treille.

October -13. Ajaccio. — International Congress of Olive Growers, organized by the Société Nationale d'Oleiculture de France.

October 16-19. Avignon. — Twenty-seventh Congress of Popular Credit (Agricultural Credit and Urban popular Credit. For adhesions to the Congress address before September 15 : M. Maurice Dufourmantelle, Secretaire du Centre Fédératif, Paris, 95 Rue Kléber.

Germany.

1913. September 3-6. Breslau. — General meeting of the Deutsche Bunsengesellschaft.

September 18-20. Hamburg. — Thirty-sixth general meeting of the "Verein zur Wehrung der Inleressen der Chemischen Industrie Deutschlands".

1915. Munich. — International Congress of Brewery Workmen.

Italy.

1913. September 22-26. Siena. — Seventh Meeting of the "Società Italiana per il Progresso delle Scienze".

Spain.

1913. September. Soria. — Agricultural Congress.

Switzerland.

1914. June 8-10. Bern. — Sixth International Dairy Congress, organized by the "Association Universelle de l'Industrie Laitière".

United States.

October 1-4. Atlantic City, N. J. — 53rd. Annual Convention of the U. S. Brewers' Association.

October 9-11. Pittsburgh, Pa. Annual Convention of the U. S. Master Brewers' Association.

CROPS AND CULTIVATION.

GRICULTURAL
ETEOROLOGY

909 - **Evaporation from a Free Water Surface at Lincoln, Nebraska.** — LOVELAND G. A. and PERIN, S. W. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 193-197. Lincoln, Nebraska, 1912.

The evaporimeter used at the Nebraska Experiment Station consists of a galvanised iron pan 3 feet square and 10 inches deep floated on a tank by means of two iron pontoons. A graduated scale is adjusted to the outside of the pan and the evaporation is read off daily on the scale, the pan being refilled several times a month. The data obtained during the summer months of the years 1895-1910 are tabulated, together with the records of rainfall, temperature and wind velocity.

910 - **Evaporation from a Plain Water Surface.** — LEATHER, J. W. in *Memoirs of the Department of Agriculture in India, Chemical Series*, Vol. III, No. 1, pp. 1-15. Calcutta, May 1913.

A description is given of the evaporimeter in use at Pusa which consists essentially of a circular cement tank 6 ½ feet in diameter and 5 feet deep, with an adjustable pointer for measuring the water level. Records for 1911 and 1912 are tabulated and compared with other data obtained from the observatories at Madras and Lyallpur. The total evaporation was 4.15 feet per annum at Pusa, 6.42 feet at Lyallpur, and 6.34 feet at Madras, but its distribution between hot and cold weather varied considerably with each point of observation.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

911. – **Cupric Treatments and the Nitrification of the Soil.** – PATUREL, G. (Director of the Agricultural Station of Saône-et-Loire) in *Le Progrès agricole et viticole*, Year 30, No. 23, pp. 711-714. Montpellier, June 8, 1913.

Vineyard soil receives annually a varying amount of copper salts owing to the use of cupric washes as a protection against cryptogamic diseases. Different opinions are held with regard to the probable influence of this treatment upon the fertility of the vineyards. Apart from a possible catalytic action, the accumulation of a certain amount of copper in the soil might be injurious to nitrification. In order to investigate the matter, the writer made the following series of experiments.

Five funnels were each filled with 500 gm. of fine, loamy air-dry soil, containing only 3 per cent. of calcium carbonate; 0.5 gm. of ammonium sulphate were added, and the whole was watered with solutions of copper sulphate, so as to introduce the following amounts:

1. None.
2. 10 gm. of copper sulphate (2 % of the soil)
3. 5 gm. » » (1 % » »)
4. 1 gm. » » (0.2 % » »)
5. 0.5 gm. » » (0.1 % » »)

The funnels were placed on receptacles and kept from February 26 to April 20 at a suitable degree of moisture in a warm room.

The amount of nitrified nitrogen was then determined; the soils were methodically washed, and 500 cm. of drainage water was collected from each, which, when analysed, gave the following results:

	Nitrified nitrogen mgm.
1. Control	103.8
2. 2 % of copper sulphate	62.0
3. 1 % » »	71.3
4. 0.2 % » »	88.3
5. 0.1 % » »	94.5

Assuming that the nitrification of the control was almost complete (103.8 mgm. in place of 105 mgm. furnished by 0.5 gr. of ammonium sulphate), the conclusions are that:

I. The presence in soil of copper salts affords no special obstacle to nitrication: with above 2 per cent. of copper salts, the nitric nitrogen was still 60 per cent. of that contained in the control, and with 0.1 per cent of copper sulphate, the nitric nitrogen rose to 90 per cent. of that in the control.

II. Copper salts, introduced into the soil, rapidly assume an insoluble form when in contact with calcium carbonate, iron oxide, and alumina, which accounts for their weak inhibitive action on nitrification, even when large quantities are employed.

Finally, seeing that the copper which finds its way into the soil from the alkaline washes is already in an insoluble condition, there is thus no reason to apprehend injurious results from the frequent use of cupric washes.

PERMANENT IMPROVEMENTS. DRAINAGE AND IRRIGATION

912. – **New System for Draining Land and Freeing it from Salt.** – MOSSERI, V. in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, Vol. XII, Parts III and IV, pp. 215-239. Montpellier, 1913.

This system of drainage shown in the accompanying Plate is applicable wherever the surface of the soil is somewhat higher than the level of the water in the main drainage canal, so as to allow a good drainage of the surface water, without however allowing a good drainage of the subsoil.

Principle of the System. — This new system, which is a combination of draining the soil and freeing it from salt, is carried out as follows: a collecting ditch (*C*) 50 to 60 inches deep is opened between the field (*A*) and the main drainage canal (*B*). The water collected by the ditches in the field is led into the main canal by means of small wooden or iron pipes and a pump is situated at the end of the collecting ditch C. By this arrangement a part of the water, namely that which percolates through the soil, is raised by the pump and thus got rid of, while the remaining water flows along the surface. The installation required by this system is simple and not costly.

Application of the system.—It has been applied for the last four years in the irrigation of rice fields in the northern parts of Lower Egypt. The results obtained in 1909 and 1910 have been communicated to the "Institut Egyptien" (1). In 1911 the system was extended to an estate of 1729 acres.

Network of drains. — The drainage ditches must be at least 36 inches deep. A depth of 44 inches appears to be sufficient. The observations made, following Delacroix's method, have shown that these ditches must be excavated at 66 to 132 feet from each other, the distance varying with the greater or lesser permeability of the soil, its degree of saltness and the rapidity with which it is desired to free the land from salt. The strips of land (*D*) should not be longer than 670 feet; the most advantageous length would be about 500 feet. The collecting drains that lead to the pumps should not have a fall inferior to 0.25 per 1000.

Pumping station. Amount of infiltration water. — In order to calculate the power of the pumps it is indispensable to know the amount of water drained per acre and per day. The formulae of Slichter and of King based on the laws of Poiseuille and Darey allow an approximate estimation to

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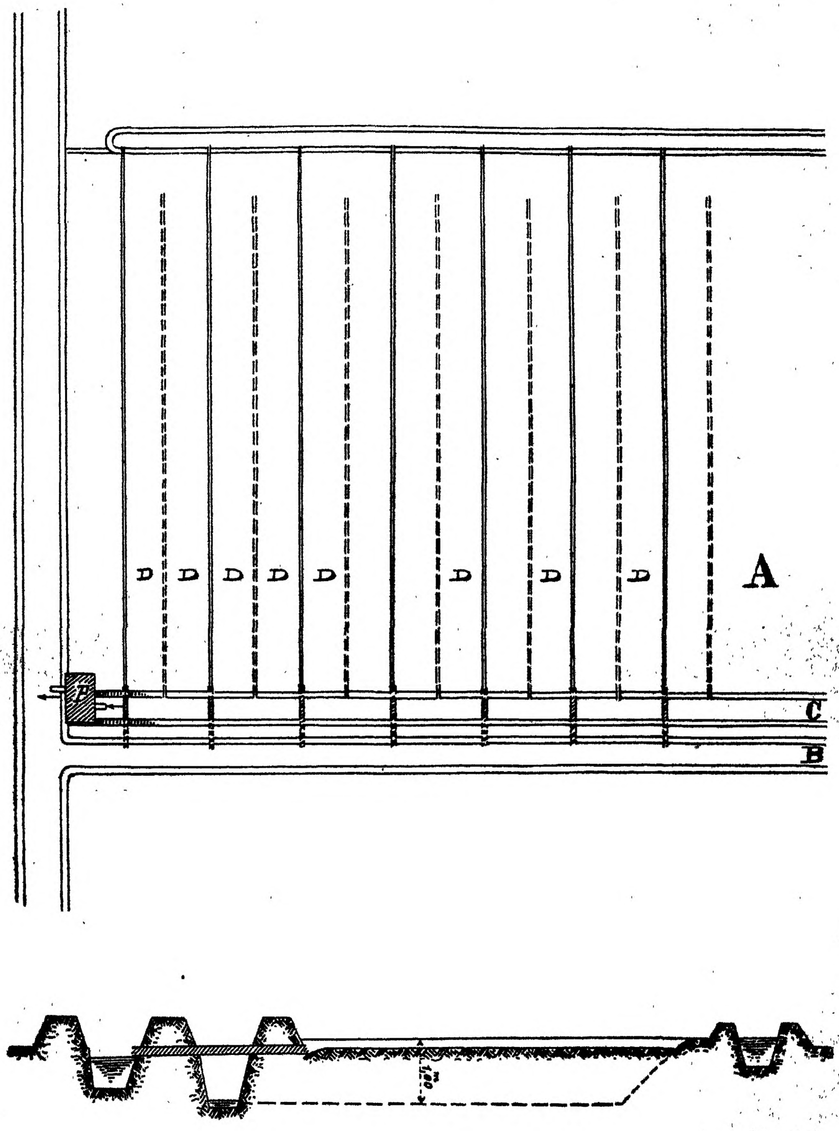
(1) VICTOR MOSSERI. Note sur un nouveau dispositif pour l'évacuation des eaux de drainage et d'assainissement. — *Bulletin de l'Institut Egyptien.* Vol. III, 5th Series, 1908, pp. 101-119; and Nouvelles observations sur le système de lavage superficiel et drainage combinés; *Ibid.* Vol. V. pp. 102-136.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Plan and section showing new system for draining land and freeing it from salt.

be made of the quantity of water that can percolate through the soil in a given time. A direct determination may also be made by means of suitable apparatus. The experiments made in 1910 gave as an average 400 cubic feet of water per acre in 24 hours during the period of low water and 543 cub. ft. during the high water period, and this with the ditches at 133 ft. from each other. When this distance was reduced to 66 feet the amount of water rose to 686 cub. ft. during the high water period. In 1911 at the same period and with 66 feet between the ditches the amount of water ranged from 372 to 686 cub. ft.

Results. — The amount of water removed by pumping in the above described drainage installation was only one half to two fifths of that which would have to be pumped according to the usual system. Further, the water removed is 10 to 100 times richer in salt than that removed by surface drainage.

Naturally these figures are not absolute, they only give a general idea of this new process. The results obtained on each of the seven sections at Ezbeh Baharieh have been collected in 14 tables and presented to the "Institut Egyptien" (1). The writer gives as a specimen 4 tables referring to sections 6 and 7.

Cost. — This system compared with the usual system of drainage entails a somewhat greater expense and a slight diminution of the cultivable area owing to the larger number of ditches. The expenses of installation and upkeep are also heavier; the difference however is not considerable. The loss of cultivable area is between 2 and 3 per cent. The greater expense of installation is about 13*s* to 14*s* 6*d* per acre if wooden pipes are used and 19*s* to 21*s* if iron ones are used. The increase in the upkeep rarely exceeds 5 to 10 per cent.

913 - **Drainage Experiments in Belgium.** — Expériences d'agriculture organisées à l'école de bienfaisance de l'Etat à Ypres en 1912. — *Ministère de l'Agriculture et des Travaux Publics, Rapports et Communications,* No. 5, pp. 75-72. Brussels, 1913.

The object of these experiments was to ascertain the most advantageous depth of the drains in silty soils. The field to be drained is 2.47 acres in extent and is divided into four sections each of 0.62 acre.

Plot	1	Depth of drain	4 ft. 8 in.	Distance between the drains	33 ft. 4 in.
»	2	»	4 ft. 0 in	»	»	»
»	3	»	3 ft. 4 in	»	»	»
»	4	»	2 ft. 8 in	»	»	»

The field was drained at the end of March 1912 and on April 12 it was planted with potatoes. Every plot contained 52 rows. The seed-potatoes were laid by hand in their holes; the selection and grading was done very carefully. The weather was very rainy. The crop was lifted on September 28 and 30, each plot being harvested separately, and the potatoes were graded into large, small and diseased, each kind being weighed by itself.

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(1) V. Mosseri. Nouvelles observations sur le système de lavage superficiel et drainage combinés. — *Bulletin de l'Institut Egyptien,* Vol. 5, pp. 102-136.

The following table shows the results.

Number of Plot	I	II	III	IV
Depth of Drain	4 ft. 8 in.	4 ft. 0 in.	3 ft. 4 in.	2 ft. 8 in.
	cwt.	cwt.	cwt.	cwt.
Large potatoes	79.30	83.83	102.85	96.92
Small	16.52	15.69	15.78	14.49
Diseased	14.64	12.83	9.60	10.23
Total yield . . .	110.46	112.35	128.23	121.64
Yield per acre . . .	178.84	181.87	207.58	196.91

The third plot, in which the drains were at a depth of 40 inches, gave the greatest yield and the smallest quantity of diseased potatoes.

914 - **Warping in England.** — STEPHENSON, J. in *Journal of the Royal Agricultural Society of England*, Vol. 73, pp. 104-113. London, 1912.

Arthur Young describes the process of warping in the following words: "The water of the tides that come up the Trent, Ouse, Don, and other rivers which empty themselves into the great estuary of the Humber, is muddy to an excess, insomuch that in summer, if a cylindrical glass twelve or fifteen inches long be filled with it, it will presently deposit one inch, and sometimes more, of what is called "warp". Where warp comes from is a dispute. The Humber at its south is clear water; and no floods in the countries washed by warp rivers bring it, but on the contrary do much mischief by spoiling the warp. In the very driest seasons and longest droughts it is best and most plentiful. The improvement is perfectly simple and consists in nothing more than letting in the tide at high water to deposit the warp and permitting it to run off again as the tide falls; this is the aim and effect".

The system probably dates from about 1730, and though found to a limited extent in other parts of the country, extensive areas are met with only in North Lincolnshire and South-East Yorkshire where it covers roughly about 300 square miles.

In olden times, the high tides used to overflow onto either side of the river bed, and the water, having deposited its sediment, drained off onto the low lands further away. When the rivers were banked in, strips ¼ to ½ a mile wide on either side became fertile tracts of land which were greatly esteemed as they were well drained and produced good crops in all seasons. Behind these strips there exist tracts of lower land waterlogged owing to their being below the level of the river. Such land, which is of little value in its natural condition, immediately becomes valuable if it can be covered with a thick coating of warp, and if not too distant from the river it may be subjected to the process. The area is surrounded by a bank and connected with the river bed by means of a warping channel which is provided with sluice gates. The richly charged tide water is then led into the basin as the tide rises, deposits its sediment and runs out again as clear water on the ebb. The process is carried out twice a day during the spring tides (i.e. the highest tides) of the summer months, but not in the late summer or in winter, and as each flooding may result in a deposit of an eighth of an inch when dry, in 2 or 3 years the surface may be raised 2 to 3 feet. The flooding is then stopped and white clover is sown. Whilst under that crop the land is drained by means of ditches discharging into the warping channel which thus becomes a main arterial drain. Later the land is cut up into farms of 150 to 200 acres, buildings are erected and the farms are let at £2 per acre or more.

One district deserves special mention and that is Thorne Moors. Covering an area of 16 square miles between the rivers Trent and Ouse, it is a comparatively high piece of peat land, which until recently was a dangerous swamp. It has now been dried by means of deep ditches and the peat is being exploited commercially. At the same time the removal of the peat lowers the surface of the soil and thus renders it available for warping and ultimate cultivation.

The cost of reclamation by warping varies within wide limits according to general conditions. It is naturally reduced if the sluices, which form one of the heavist expenses, can be made to serve for a very large tract of land, say two or three thousand acres. In the case of Thorne Moors the cost has been estimated at £20 per acre, which includes the cost of preparing the land for farming but not the erection of buildings; this estimate would probably be lower than most as the circumstances in this undertaking are especially favourable.

Warp land on the whole is very well farmed and first rate crops are obtained. Potatoes are the most important crop, being highly manured and producing 10 to 12 tons per acre. They are followed by wheat which yields 8 to 9 quarters per acre and then by a root or forage crop. Sheep are the exception on warp farms, but cattle are kept, and a large number of pigs are reared and fed to provide an economical means of disposing of waste and diseased potatoes.

915 - **Irrigation Experiments at the Experimental Farm of the Royal-Imperial College of Agriculture at Gross-Enzersdorf (Austria).** - *Zentralblatt für Landwirtschaft*, Year 93, No. 9, pp. 101-112. Brünn, May 1, 1913.

The area to be irrigated was a 10 acre field of lucerne, which at the beginning of the operations, was in its fourth year. As levelling was impossible, and the nature of the ground precluded the use of irrigation channels, the field had to be flooded. The experiments were made in 1908, 1909 and 1910. The five years' precipitation observations made at the experimental farm showed a normal deficit in the rainfall accentuated by the unfavourable distribution of the rains. Underground water only could be employed for irrigation, as surface-streams were lacking. The water was raised by means of centrifugal pumps driven by benzine-motors. Of the 10 acres, an area of 1 hectare (2.47 acres) was selected for experiment. This was divided into 10 plots of a quarter of an acre each. One plot remained unirrigated and acted as control. The other plots were so irrigated that three received obont 148 000 cu. ft. of water during the vegetative period, three received 258 000 cu. ft., while the other three were only irrigated in the autumn. All the lots were manured alike,

The following results were obtained:

On the unirrigated plot, there was a close relation between the temperature and the time of harvest and also between the rainfall and the amount of the crop. This plot yielded three crops with 28 cwt. of dry substance per acre. Only the first crop was satisfactory, the others being poor and unreliable.

Four crops, hovever, were obtained from the irrigated plots, the average results being as follows:

1. Plots irrigated during the vegetative period with 148 000 cu. ft. of water produced 4 tons of dry matter per acre.
2. Plots irrigated during the vegetative period with 258 000 cu. ft. of water yielded 3 tons of dry matter per acre.
3. Plots which were only irrigated in the autumn yielded 3½ tons of dry matter per acre.

Thus an excess of moisture caused a decrease in the crop. The technical preliminary investigations were carried out by the prof. of agriculture at the College, Dr. R. Fischer (Civil Engineer).

916 - **Irrigation Experiments with Brackish Water.** — Report of Prof. ORESTE BORDIGA to the President of the Italian Royal Irrigation Commission. In IV°, pp. 22, 1913.

In the Province of Bari there is a strip of cultivated land along the Adriatic coast irrigated by water which is perceptibly brackish owing to infiltration of sea water through the crevices of the limestone subsoil. This land is chiefly under tomatoes, but various brassicas, capsicums, the egg-plant, and even in some places cotton, are also cultivated. Owing to this fact, in 1911, a Royal Commission on Irrigation recommended that a series of experiments should be undertaken using water of different degrees of salinity, in order to ascertain whether it would be possible to utilize brackish water for irrigation on a large scale. The experiments were carried out in 1912 by the Station of Agricultural Chemistry of the Royal College of Agriculture at Portici in the district of Vitulazio near Capua. Pot cultures were adopted and brackish water from the Province of Bari was used.

The analyses of 30 samples of this water are given. Its composition varies. In the case of the minimum salinity, the dry residue at 120° C. was 0.272 per cent., the chlorides calculated as NaCl were 0.1696 per cent., and the carbonates calculated as Na_2CO_3 were 0.0424 per cent. In the case of the maximum salinity the dry residue at 120° C. was 0.802 per cent., the chlorides calculated as NaCl were 0.588 per cent., and the carbonates calculated as Na_2CO_3 were 0.0466 per cent. Detailed analyses of the soil too are given, showing that it was clayey, and good both with regard to its mechanical structure and its chemical composition; and analyses are also given of the water used for the experiments (dry residue at 100° C., 0.7389 per cent; at 180° C., 0.684 per cent.).

The trials were begun late in the season (July); they were therefore only regarded by the writers as preliminary, and will be continued. Nevertheless the results obtained up to the present are tabulated in great detail. Seeds of cotton, chicory, maize and tomatoes were planted in zinc vessels, each containing 82 to 84 kilos (180 to 185 lbs.) of soil, and manured by the addition of 12 grams of bicalcic phosphate and the same amount of ammonium sulphate. The cotton and chicory died off, and were discarded, but the other two were each watered with four different solutions:

a) pure water (from Serino);
b) water containing $^1/_4$ of the total salts (0.1847 per cent);
c) water » $^1/_2$ » (0.369 »);
d) water » $^3/_4$ » (0.5541 »);
e) water » total salts (0.7389 »).

The plants were watered when they appeared to need it, and received every time sufficient to form a stratum of from 1.2 to 3.6 cm. deep, the total amount received being 36.6 cm. in the case of the maize, and 33.6 cm. in that of the tomatoes. The cultures were sheltered from rain.

During the vegetative period the maize plants appeared to suffer from the salts, especially when they were present in the larger quantities, while on the other hand, the tomatoes seemed in no wise affected by the salts added to the soil, although these were present in the proportion of 5 tons per acre in the receptacles watered with the strongest solution. The area of each pot was 1.8 sq. ft. and there were 3 plants of maize or 2 to 3 tomato plants in each. At harvest-time (October 26) the results obtained were as follows:

Watered with	fresh water	¼ strength	½ strength	¾ strength	undiluted
	gms	gms	gms	gms	gms
Maize:					
total average weight of each plant	46.5	32.8	28.15	26.15	28.7
Tomatoes:					
total average weight of each plant	105.9	58.45	67.1	56.8	97.0
average weight of fruit of each plant.	101.6	57.4	62.8	53.4	93.6

In the case of maize the yield decreased with an increase in the salt; in the case of the tomatoes, the maximum weight of plant was obtained with least salt, but the weight of fruit obtained with the maximum amount of salt was greater than that obtained with the smaller doses, though smaller than when fresh water alone was used. With reservations as to the reliability of the results when calculated into yields per acre, the writers note that maize irrigated with fresh water yielded within four months at the rate of 50 cwt. of dry matter per acre, and when irrigated with entirely brackish water the yield was a little less than half. Tomatoes with fresh water yielded at the rate of 18.3 cwt. of dried stems and leaves per acre and 121 cwt. of fruit per acre, while with wholly brackish water the weight of the dried stems and leaves would be 20.3 cwt. and that of the fruit 111.5 cwt.

In subsequent experiments cotton and lucerne will be used, as well as the two above-mentioned plants.

MANURES AND MANURING

917 - **Fertilizer Experiments on Peaty Meadows in Hungary.** — GYÁRFÁS, JÓZSEF, in *Köztelek*, Year 23, No. 43, pp. 1553-1554, Budapest, June 7, 1913.

Repeated manurial experiments on peaty meadows carried out at the Royal Agricultural Station of Magyaróvár had shown the efficiency of phospho-potassic manures for increasing the yield of hay both qualitatively and quantitatively, and in 1909 in order to popularise the use of this class of fertilizer on the peaty meadows of Hungary, the Experimental Station undertook a series of new trials, partly on the grass lands at Hansag bordering the Lake of Balaton, and partly on the land belonging to the local government at Haromszék. For each trial two plots of 1 katastral joch (1.42 acres) each were selected; one acted as control and the other received 440 lbs. of superphosphate and 165 lbs. of 40 % potassic fertilizer (3 cwt. of superphosphate and 1 cwt. of potassic fertilizer per acre). Trials were made in 40 different places, but of these only 24 gave reliable results, which may be divided into 3 groups showing the effect of the manures on the yield of hay 1, 2, and 3 years after the application of the manures. The figures are given in the adjoining table.

The mean increases in yield show that peaty meadows answer readily to the application of fertilizers, the increased yield per acre amounting to 15.2 cwt. the first year (mean of 24 experiments), 9.4 cwt. the second year (mean of 17 experiments), and 5.0 cwt. the third year. The cost of the above dressing should not be above £1 10*s* per acre, and if the hay be valued at 1*s* 9*d* per cwt. the application of the phospho-potassic dressing is evidently highly remunerative.

No.	Locality	Increased yields of hay per acre due to manuring			
		1910	1911	1912	Total
		cwt.	cwt.	cwt.	cwt.
	Results of 1 year				
1	Mosonszentpéter I	16.7	—	—	—
2	» II	19.3	—	—	—
3	Mosontétény I	26.5	—	—	—
4	» II	16.7	—	—	—
5	» III	29.9	—	—	—
6	Igricze	13.9	—	—	—
7	Lukafa	8.3	—	—	—
	Mean . . .	17.7	—	—	—
	Results of 2 years.				
8	Mosonszentpéter III.	13.2	15.2	—	28.4
9	» IV	13.9	19.3	—	33.2
10	» V	66.8	19.3	—	86.1
11	Mosonszentjános I	7.0	8.3	—	15.3
12	» II	8.3	13.9	—	22.2
13	Mosontarcsa I	16.0	15.8	—	31.8
14	Tapolcza	13.9	13.9	—	27.8
15	Pötréte.	4.3	5.8	—	10.1
16	Kézdimartonfalva	2.2	8.9	—	10.2
	Mean . . .	16.2	13.3	—	29.5
	Results of 3 years				
17	Lébény I	6.3	3.6	4.1	14.0
18	» II	12.6	14.7	14.5	41.8
19	» III	9.3	9.1	5.5	23.9
20	Mosontarcsa II	28.5	3.4	7.0	38.9
21	Bak	16.7	6.7	4.1	27.5
22	Zalaapáti	8.0	1.6	1.0	10.6
23	Esztergály	10.5	3.6	1.9	16.0
24	Báránd	6.6	4.2	2.5	13.3
	Mean . . .	12.3	5.9	5.0	33.2
	Total means . . .	15.2	9.4	5.0	—

918 – **New Experiments on the Utilization of Phosphates in Russia.** — 1. KOTCHEKOV, V. in *Isviestia Moskovskago Selskokhosiaistvennago Instituta*, Year XIX, Part I, pp. 33-55, 55-59, 60-68, 69-72 and 205-222. Moscow, 1913. — 2. PERITOURIN, TH. T. *Ibid.*, pp. 142-151. — 3. JAKOUSHKIN, I. V. *Ibid.*, pp. 152-178. — 4. GALZEV, P. E. and JAKOUSHKIN, I. V. *Ibid.*; pp. 193-204 and 223-232.

The above papers describe the continuation of experiments made in Prof. Prianishnikov's laboratory at the Moscow Agricultural Institute, with the object of utilizing the poor phosphates of Central and Eastern Russia (1).

M. Kotchekov reports experiments, made at the instigation of Prof. Prianishnikov, on the use of sodium bisulphate (industrial residue from the manufacture of nitric acid) in concentrated solutions (D = 1.475) for treating Viatka phosphates (57.7 per cent. tricalcic phosphate) and Smolensk phosphates (32.6 per cent. tricalcic phosphate), dissolving respectively 97 and 95 per cent of the total phosphoric acid. On treating the solution with milk of lime, a precipitated phosphate was obtained containing an average of 25.3 per cent. of P_2O_5 of which 92.6 per cent. was soluble in Petermann's ammonium citrate; the Viatka phosphate alone gave 37 per cent., with 91.5 per cent. citrate-soluble, while the Smolensk gave 22 to 34.4 per cent. and 98 to 66 per cent. citrate soluble.

The residue from the manufacture of trinitrotoluene contains, after the third nitration, an average of 62 to 72 per cent. of sulphuric acid, 2 to 3 per cent. of nitric acid, and 0.3 per cent. of organic matter. The results of experiments in preparing superphosphates from Viatka phosphates by means of this residue and by ordinary sulphuric acid are given in Table I.

TABLE I.

	Nitro superphosphate			Ordinary superphosphate				
	No. 122		No. 154	No. 31		No. 32		No 34
	Not dried	Dried at 85°	Not dried	Not dried	Dried at 85°	Not dried	Dried at 85°	Not dried
Sulphuric acid at 52° Beaumé used for treating 20 parts of phosphate . .	13.2		13.2	13		13.5		14.0
Analysis of the superphosphates (calculated on the dry matter)								
Total P_2O_5	17.2	17.3	17.9	17.1	17.0	16.8	16.8	17.1
Citrate-soluble P_2O_5 . .	—	—	—	16.4	16.2	16.7	16.3	16.7
Water-soluble P_2O_5 . .	15.24	13.7	15.4	12.9	12.6	14.0	13.7	14.4

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(1) See No. 898, *B.* June 1912. (*Ed*).

The analyses show the good quality of the nitrosuperphosphates, which are also drier and more powdery than the ordinary super.

Fresh experiments were undertaken on the preparation of double superphosphates by using sodium bisulphate. Superphosphate prepared from Viatka phosphates and sodium bisulphate was dissolved, and the filtered solution was concentrated on a water-bath, the crystals of sodium sulphate formed being removed. When concentrated to 45° Beaumé the solution contained 20 to 22 gms. of $P_2 O_5$ per litre and attacked degelatinized bone dust vigorously; by this means a double superphosphate was formed containing up to 24.3 or 25.6 per cent. of $P_2 O_5$, of which 98.3 or 92 per cent. was water-soluble; this product contained some sodium sulphate but its physical properties were satisfactory.

Experiments were made on the preparation of superphosphates with the sulphuric acid residue from the purification of petrol. This residue contained 931 gms. of sulphuric acid per litre, with a density of 49.6° Beaumé; it was used on amounts between 50 gms. and 2 kg. of degelatinized bone dust and Viatka phosphate, and on a larger scale on 20 kg. of Viatka phosphate. The phosphoric acid of the bones was almost completely dissolved, and the result was a superphosphate containing 21.25 per cent. of total $P_2 O_5$ and 21.12 per cent. water-soluble; the super from the Viatka phosphates contained 14.27 per cent. of total $P_2 O_5$ and 12.74 per cent. water soluble. Both the products were sufficiently dry and powdery.

M. Peritourin has studied the conditions of equilibrium occurring during the preparation of double superphosphate by means of sodium bisulphate. For this purpose phosphoric acid and sodium sulphate were dissolved in the proportions in which they are formed when calcium phosphate is treated with sodium bisulphate; as the evaporation over the water-bath proceeded, recrystallization of sodium sulphate with a little monosodium phosphate took place; at a density of 1.40, only 5 per cent. of the $P_2 O_5$ had precipitated.

Following previous culture experiments in Prof. Prianishnikov's laboratory, M. Jakoushkin has carried out sand-cultures of oats, barley, wheat and millet for three years; he has confirmed the fact that certain Russian phosphates may serve directly as a source of phosphoric acid for Gramineae. Senguiley phosphates give results only a third below those with soluble phosphates. Other phosphorites from the governments of Simbirsk and Saratov have proved to be utilizable by Gramineae, if not totally, at least to the same extent as the Senguiley phosphates, as regards the nearly insoluble protein phosphorus of plants. These phosphorites come from the Gault, but not all phosphorites of the Cretaceous period possess this valuable property. These phosphorites are highly soluble in ammonium citrate (Wagner's or Petermann's). By three extractions with Wagner's reagent about 20 per cent. of the $P_2 O_5$ was obtained from an ordinary phosphorite, and over 50 per cent. from the Senguiley phosphorite. Petermann's reagent extracted 14 per cent. of the $P_2 O_5$ from Senguiley phosphorite, but only traces from an ordinary mineral phosphate. These results encourage the hope that certain mineral phosphates of the Albian (Gault) series may be used directly as manure.

Pot cultures in sand carried out by MM. Galzev and Jakoushkin, with plants possessing considerable power of assimilating phosphoric acid (lupins, buckwheat, mustard), confirm the comparatively easy assimilability of the Albian phosphates, and in particular of those from Senguiley.

Some of the results are shown in Table II.

TABLE II.

P_2O_5 in the crop, mgm. per pot.

Phosphorite	Yellow lupins		Buckwheat
	I.	II.	
Senguiley (Gault)	60.96	96.89	102.0
Sinenkije (Gault)	—	82.13	—
Mangishlak (Gault)	—	—	77.1
Penza (Neocomian)	41.92	—	—
Durman (Turonian)	20.45	—	—
Burluk (Turonian)	—	43.75	71.5
Novoselki (Rjasen)	—	—	49.5
Kusjminski (Rjasen)	—	—	27.5

Using cultures in pots containing 4 kg. of sand, M. Kotchekov studied the comparative action of the phosphoric acid soluble in ammonium citrate of the various phosphatic manures. In the fourteen series of experiments with flax, oats and millet, the nutritive elements were used in the usual quantities, except in the case of phosphoric acid, which was given at half the strength so that any lack of it would show up better. The amount added was 0.142 gm. of P_2O_5, either dissolved in citric acid, or citric acid and water, or in an insoluble form. Table III shows the phosphatic manures used.

The experiments showed that the value of the phosphoric acid soluble in Petermann's ammonium citrate varies considerably. Thus the action of that from basic slag and precipitated phosphates was excellent, while that from washed superphosphate and bone dust was almost none. Exceptions were given by washed Viatka superphosphate, which had a satisfactory action, and Smolensk precipitated phosphate (obtained by the use of sodium bisulphate and first product of precipitation by lime), which had an unfavourable action.

TABLE III.

	P_2O_5		
	total	soluble in citrate and water	soluble in water
1911 *Experiments.*			
1. Ordinary superphosphate	—	17.9	16.9
2. Kostroma superphosphate	—	14.2	10.1
3. Id. water washed	—	4.2	—
4. Precipitated phosphate	40.1	37.4	—
5. Id. from Smolensk .	43.9	28.3	—
6. Basic slag	13.5	—	—
7. Degelatinized bone dust.	13.2	2.2	—
1912 *Experiments.*			
8. Carolina superphosphate	—	15.9	12.5
9. Id. washed in water and calculated as citrate-soluble P_2O_5 . .	—	—	—
10. Viatka superphosphate	—	14.7	12.5
11. Id. washed	—	—	—
12. Washing water from 11	—	—	—
13. Precipitated Smolensk phosphate, prepared with sodium bisulphate. . . .	34.4	23.6	—
14. Basic slag	13.5	4.8	—
15. Id. soluble in Wagner's citrate. .	—	10.8	—

MM. Galzev and Jakoushkin have carried on experiments for three years on the action of pyrites and its oxidation products. These have shown that the breaking down of the pyrites cannot be counted on during the period of growth ; mixtures of pyrites and phosphorite gave no increase in the assimilation of phosphates by oats. But altered pyrites, containing sulphates and sulphuric acid, exercises a dissolving action on phosphorites. In normal Hellriegel cultures both ferrous and ferric sulphates increase the assimilation of phosphates.

Considering the importance for Russian agriculture of a local supply of phosphatic manures, these investigations have shown that Russian phosphorites, in spite of their relative poverty, present possibilities of economic utilization *a*) by treatment with residues of other industries, *b*) by direct use of those specially suitable for the purpose.

919 - **The Phosphate Question in Tunis.** — BERTAINCHAUD, E. (Director of the Official Laboratory for Agricultural and Industrial Chemistry in Tunis). Les Phosphates Tunisiens: leur Origine et leur Assimilabilité. Exportation de l'Acide Phosphorique par les Récoltes. — *Revue agricole et viticole de l'Afrique du Nord,* Vol. II, Nos. 54, 55, and 56, pp. 268-270, 292-297 and 323-325. Algiers, March 22 and 29, and April 5, 1913.

The soils of Tunis are generally poor in phosphoric acid, both as tribasic phosphate and as assimilable phosphoric acid. The high lime content checks the dissolving action of the weak acids in the interstices of the soil.

Tunis is a cereal-exporting country, and though the reserves of fertility are considerable, the soil eventually becomes worn out, and the low yields show that these reserves are now considerably reduced.

The final estimates of the Food Supply Committee of the Regency fix the yield of wheat at 4 qx. per ha. (nearly 6 bu. of 60 lbs. per acre) over the whole area under cultivation ; analyses made by the writer furnish the following data.

Cereals exported from Tunis during the period 1907-1912		P_2O_5 exported	
—		% of grain	total
Wheat	126 320 tons	0.82	1 036 tons
Barley	356 600 »	0.72	2 568 »
Oats	244 400 »	0.55	1 344 »
			Total = 4 948 tons

Livestock exported from Tunis during the period 1907-1912	Weight of bones	P_2O_5 exported	
583 113 head	4 393 tons	878 tons =	878 »
		Total P_2O_5 exported	5 826 tons

This amount represents a real loss for Tunis, as the corresponding imported products are consumed in the towns and leave no residues for agricultural use.

But Tunis possesses some of the most important deposits of phosphates in the world ; only they cannot be used direct, even finely ground, owing to the amount of limestone in Tunisian soils, except the sandstone soils of Kroumiria.

In this connection, the writer remarks that, with an exportation of 1 828 000 tons of phosphate from Tunis in 1912, there is a mean annual importation for the period 1907-12 of 4601 tons of superphosphate, corresponding to 2037 tons of calcium phosphate (1).

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(1) According to a report sent to us by the Director-General of Agriculture, Commerce and Colonization, a new local factory, with a potential output of 20 000 tons, put 10 000 tons on the market in 1912. This would account for the lowering of the importation from 9184 tons in 1911 to 2759 tons in 1912. See: *Production et consommation des engrais chimiquea dans le monde,* pp. 66-69: Rome, 1913. (*Ed.*).

The average phosphoric acid content of soils in Tunis is 0.08 per cent; reckoning a density of 1.5 and a depth of 8 in. of ploughed soil, there would be 2130 lbs. of $P_2 O_5$ per acre; to reach the 4450 lbs. given by Joulie for normal fertility, 2320 lbs. must be added; this would mean applying 6 ½ tons of super at 16 cer cent., or 3 ½ tons of a phosphate at 30 per cent., making an expenditure of £ 16 or £ 6 per acre. But it would no doubt be sufficient to replace twice the amount removed: a good average crop of wheat of 26 bu. would remore 20 lbs. of $P_2 O_5$; this could be replaced by 270 lbs. of superphosphate at 16 to 17 per cent., making (at present prices) a total cost of 7s 6*d* per acre. This would be amply repaid by 1 ½ bushels increase in the crop of wheat, where as an excess of 6 bu. ought easily to be got (1).

In conclusion, the writer remarks that in Tunis superphosphate should be turned in by deep ploughing some time in advance, to give the best results.

920 - **Consumption of Superphosphates in Hungary.** — KOVÁCSY, BÉLA, in *Köztelek*, Year 23, No. 42, pp. 1532-1533. Budapest, June 4, 1913.

The above paper gives interesting data as to the consumption of superphosphates in Hungary, showing the average quantity used on a given area of cultivated land for every county, in 1907, 1911 and 1912.

The data, however, refer exclusively to the super produced in and sold by the factories affiliated to the Hungarian Association for the Use of Chemical Manures, and do not include the amounts imported; nor do they refer to other chemical manures. Superphosphate, however, is by far the most important manure in Hungary, its consumption reaching 80 per cent. of the total for chemical manures.

In a detailed table, the writer gives the figures collected in the 63 counties, dividing these into four groups according to the quantity used in 1911 and 1912. The figures of the three years show variations between ¾ lb. and 72 lbs. per acre (0.5 kg. and 46.6 kg. per arpent cadastral), but on the whole show a marked progressive increase.

The following table shows the grouping of the counties for 1911 and 1912:

Group I. (8 counties): consumption more than 25 kg. per arpent cadastral (38lbs. per acre).
Group II. (12 counties): more than 10 kg. per arp. (15lbs. per acre).
Group III. (16 counties): more than 5 kg. per arp. (7 ½ lbs. per acre).
Group IV. (27 counties): less than 5 kg. per arp. (7 ½ lbs. per acre).

The total averages for the four groups, in lbs. per acre of cultivated land, are as follows:

	1907 —	1911 —	1912 —
Group I.	16.7	36.2	44.2
» II.	6.4	18.4	21.5
» III.	3.3	9.5	10.9
» IV.	1.0	3.0	3.4

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(1) See No. 346, *B.* April 1913. (*Ed.*).

921 – **Experiments with Radio-active Substances.** — BERTHAULT, E., BRÉTIGNÈRE, L. and BERTHAULT, P. in *Annales de l'Ecole Nationale d'Agriculture de Grignon*, Travaux du Laboratoire d'Agriculture 1910-1911-1912, Vol. III (Agriculture), pp. 1-62. Paris, 1912.

The writers remark that the question of radio-active manures is still very obscure; to test the matter for themselves they have made a series of laboratory experiments and culture trials (1).

Laboratory experiments — The introduction of uranium protoxide at 0.05 to 1 per cent. into Knop culture solutions had good effects on some plants (French beans), and markedly harmful effects on others (barley, maize) ; the results with barley suggest that the optimum amount of the radio-active substance had been passed.

A sample of radio-active manure sent by the Radium Bank was declared to have the following percentage composition ; silica, 80.44; water and volatile organic matter, 10.54; oxides of iron and alumina, 2.20 total sulphuric acid, 5.40; soluble phosphoric acid, 1.37; soluble salts and soluble free acids, 3.32; uranium, traces; samples very variable, especially in free acids and phosphoric acid.

The writers found that this contained only 0.1109 per cent. of total phosphoric acid, and that the radio-active energy was less than 0.01 of mixed uranium oxide. In spite of its doubtful composition, it has given an increase in the fresh weight of wheat in culture experiments.

On the whole, this first series of experiments seems to show that in the first stages of growth of plants radio-active substances have a favourable action on the increase of green weight.

Field experiments (1910-1911). — The radio-active manures have been tried, according to the recommendations of the Radium Bank, in very small quantities as compared with other nutritive substances, chiefly at 2 or 3 per cent. of a dressing of superphosphate, but ranging from 1 to 10 per cent. The radio-active manure was applied alone, with superphosphate, with blood, with superphosphate and blood, and with superphosphate, blood and a potash manure. The following series of experiments were established: wheat (two series, one in pots); rye (one series); barley (two); oats (four); pulse crops (two); Leguminous fodder crops (one); fodder grasses (one); oil crops (four); flax (one); potatoes (two, one with old and fresh radio-active manure); Jerusalem artichokes and helianti (one),

The following table gives the number of experiments showing an excess (+) or a deficit (—) on the means of each series; the experiments with fresh radio active manure are not reckoned.

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(1) See No. 781, *B.* May 1912; No. 1513, *B.* Nov. 1912; and No. 350, *B.* April 1913. (*Ed.*).

	Radio-active manure used				
	alone	with super	with blood	with super and blood	with complete manure
Total weight of crop	6+, 8—,	12+, 1=15—.	1+, 1—.	2+.	2+, 1—.
Straw, dried or green stems	7+, 6—,	18+, 1=20—.	1+.	+.	2+, 1—.
Grain	6+, 8—,	17+, 22—.	2+, 1—.	2+, 1—.	2 —, 1—.
Tubers	1+, 9—,	4+, 2—.	»	»	12+, 4—

The following conclusions may be drawn from these results:

a) Radio-active manures alone may or may not be advantageous; the number of positive and negative results is about equal for the total weight of the plants, and for the stalks and grain, but the negative results are the more numerous for the tubers.

(*b* The addition of radio-active manures to superphosphate is generally unfavourable, particularly for the grain; for tubers, however, it is favourable. The following table shows the action of the radio-active manure when added in varying proportions to superphosphate.

	1 % (2¼ and 3½ lbs. per acre)	2 % (5½ and 7¼ lbs. per acre)	3 % (8 and 9 lbs. per acre)	5 and 6 % (11 and 18 lbs. per acre)	10 and 15 % (27, 36, 45 and 67 lbs. per acre)
Whole plant (stem and seed)	4+, 3—.	5+, 1=, 5—.	2+.	,,	1+, 7—.
Straw, dried a green stems	2+, 1=, 4—.	6+, 3—.	6+, 3—.	1+, 2—.	3+, 11—.
Grain	4+, 3—.	5+, 6—.	7+, 6—.	,,	1+, 7—.
Tubers	1+, 1—.	1+, 1—.	,,	,,	+

Radio-active manures at 1,2 and 3 per cent. seem to have no effect, but at 10 and 15 per cent. the negative results increase, except for tubers, for which the figures are not decisive.

c) the addition of radio-active manure to dried blood was made in only a few experiments, but the positive results seem to predominate.

d) With the addition of radio-active manure to a mixture of superphosphate and dried blood, the positive results are the more numerous, both for stems or straw and for grain.

e) Lastly the addition of radio-active manure to a complete manure generally gives a larger yield, even of tubers.

These field trials do not allow practical conclusions to be drawn; further experiments are necersary. What seems certain is that it is not advantageous to employ as much as 18 or 45 lbs. of catalytic manure with superphosphate alone. Radio-active substances seem to be more efficacious in presence of a complete manure than with phosphatic or nitrogenous manuring only; in this case the best action is with dressings of 36 to 45 lbs per acre.

RICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

922 – **The Assimilating Energy of Plants Cultivated under Different Light Intensities.** (1) - Rosé E. in *Annales des Sciences Naturelles, Botanique* Vol. XVII, No. 1-4, pp. 1-110, Paris, April and May 1913.

While various investigators have examined the effect of light intensity on the development and structure of plants, others have studied assimilation under different degrees of illumination, and the present enquiry was undertaken to connect the two series of investigations. The experiments were carried out at the Biological Laboratory at Fontainebleau during the summer months June to September.

The subsects of the research were *Teucrium scorodonia* and *Pisum sativum* chosen as being typical shade and sun-loving plants respectively, and the various light intensities were obtained by using shelters covered with woven material of different textures. Five grades of light intensity or illumination were employed, as follows:

I = $^1/_9$ of the unshaded light
II = $^1/_3$ » » »
III = $^1/_2$ » » »
IV = $^3/_4$ » » »
V = unshaded light.

The A. treats his results under five different headings:

The influence of light intensity on the production of green and dry matter and also on the external appearance of the plants.

Leaves were taken from *Teucrium scorodonia* at 3 different stages of the development of the plant and their area and green weight were determined. At the end of the experiment the whole plants were separated into root and shoot, and analysed for green and dry matter.

Both the weight and the area of the leaves were at their maximum in illumination III, but the weight per unit area, or in other words the thickness of the leaf was greatest in direct sunlight and diminished with each reduction of the light intensity. Turning to the effect on the plant as a whole, both green and dry weights diminished with each degree of shading while the water content increased, but the effect of decreasing

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(1) See also No. 351 *B* April 1913.
« 792 » July »

A) *Leaves only.*

	Area in cm²					Green weight. in mg.				
Illumination	I	II	III	IV	V	I	II	III	IV	V
Teucrium scorodonia:										
4 leaves developed . . .	—	0.1	0.2	0.2	0.1	—	5	8	9	5
6 » » . .	—	0.5	0.9	0.4	0.3	—	28	52	34	28
Adult plant	0.2	5.1	6.5	3.6	1.2	7	285	405	312	126
Pisum sativum:										
2 leaves developed	—	0.42	0.48	0.55	0.5	—	56	61	75	82
4 » » . .	—	1.0	1.4	1.7	1.2	—	82	135	173	159
Flowering	—	1.2	1.6	2.7	2.7	—	92	123	280	180
Fruiting	—	0.7	1.0	1.8	1.3	—	52	100	176	145

B) *Whole Plant.*

	Teucrium scorodonia				*Pisum sativum*		
	II	III	IV	V	III	IV	V
Green weight . . . . gms.	21.82	48.35	54.95		32.3	58.3	81.2
Dry » . . . . . »	3.96	9.90	16.06		4.0	8.35	12.91
Shoot per cent of whole plant	91.00	88.00	80.4	70.9	—	—	—

the light acted in opposite directions on root and shoot respectively, the relative proportion of shoot increasing as the shade deepened. (1)

With ***Pisum sativum*** the leaves were measured and weighed at 4 different stages of plant development, and the general results resembled those obtained with *Teucrum scorodonia* only that *Pisum sativum* showed itself far less tolerant of shade, so that the optimum illumination for the development of the leaves shifted from III to IV, and, while the green

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(1)

Illumination.	green wt. of plant, gms.	% shoot in plant	wt. of shoot. gms.
—	—	—	—
III	48.35	88.0	42.5
V	54.95	70.9	38.9

The aerial portion of the plant or, in other words, the *crop* is thefore larger in illumination III than V. (*Ed.*).

weight per unit area (i. e thickness) of the leaves at illumination II was only about $\frac{1}{5}$ smaller than that of the leaves developed at illumination V in the case of *Teucrium scorodonia*; the green weight per unit area of the leaves developed at illumination V was twice as great as that of those developed at illumination II. Moreover when considering the development of the plant as a whole, the drop in green and dry weight for each degree of shading was much more sudden with *Pisum sativum* than with *Teucrium scorodonia*. *Pisum sativum* flowered and fruited in Illuminations V and IV, and flowered but failed to fruit in illumination III; but in illumination II the plant was pathologically affected. *Teucrium scorodonia*. on the other hand, was apparently normal, though reduced in size, even in illumination II.

The chlorophyll content of the leaves was estimated by Lubimenko's colorimetric method. The results show that the chlorophyll content increased with shade and was higher in *Teucrium scorodonia* than in *Pisum sativum*, but in no case were the differences very large, and from observations made on *Pisum sativum* the variations appear to be due rather to a concentration of the pigment in the chloroleucites than to increased numbers of the latter.

Further the anatomy of the leaves was investigated and showed very marked differences especially in the case of *Teucrium scorodonia*. Leaves of the latter developed in the full light showed a very irregular surface and inconspicuous vascular bundles; when the light was reduced the leaf flattened out, became thinner, and the vascular bundles, especially the mid-rib, became larger and more prominent, with a still greater reduction of light the leaf became very attenuated. In the case of *Pisum sativum* no such differences were observed; the leaf merely got thinner; but in both cases the reduction of the palissade cells was remarked. first from two to one layers, and finally to none at all.

2) *The measurement of the Assimilating-Energy.*

This was carried out by placing a leaf in a wide test tube with a known volume of air and carbon dioxide, and measuring the amount of carbon dioxide which was absorbed in a given time (1 to 3 hours according to the rate of assimilation) the results being always expressed as cc. of carbon dioxide absorbed by 1 gm of green leaf in 1 hour, (CO_2 gram-hour). These figures naturally represent the difference assimilation minus respiration, but some preliminary experiments where the latter was determined showed that the difference though smaller was of the same order as the real figure, and could quite well be used to express the variations observed in the behaviour of the leaves.

The atmosphere used contained about 10 per cent of carbon dioxide and the tests were carried out on bright days and during the hours of greatest light. Further a constant temperature was ensured by running cold water round the test tubes.

3) *Assimilating Energy of leaves in the same degree of light intensity as that in which they were developed.*

	Cc. of CO_2 absorbed by 1 gm. of green leaf in 1 hour			
Stage in the development of the plant	1st 2 leaves developed	2nd 4 leaves developed	3rd flowering	4th fruiting
Pisum Sativum				
Developed and tested at ill. II	1.60	1.89	1.88	2.50
» » III	3.82	2.47	2.47	3.47
» » IV	4.08	5.52	4.08	7.38
» » V	6.08	5.23	4.33	8.12
Teucrium scorodonia	4 leaves developed	6 leaves developed	12 leaves developed	
Developed and tested at ill. II	2.69	4.82	7.30	—
» » III	6.13	7.00	7.13	—
» » IV	6.01	6.12	7.32	—
» » V	6.90	6.07	7.45	—

From the second stage onward the *Pisum sativum* results may be divided into 2 groups: one consisting of classes IV and V where the plant, making use of the slight degree of adaptation it possessed, was able to make up for the reduction of light at the lesser illumination by modifications in its structure and chlorophyll content, and the other consisting of classes II and III where the assimilating energy is definitely lower and proportional to the available light. *Teucrium scorodonia,* on the other hand, shows throughout its development a very great adaptability to shade though the high assimilating energy of plants in class II is not developed till the 3rd stage.

4) *Assimilating Energy of plants developed under different degrees of light intensity when exposed to direct sunlight.*

Stage in the dev. of the plant	Cc of CO^2 absorbed by 1 gm. of green leaf in 1 hour at ill. I			
	1st 2 leaves developed	2rd 4 leaves developed	3rd flowering	4th fruiting
Pisum sativum				
Plant dev. at ill. II	3.74	1.26	1.17	2.98
» III	4.53	1.45	6.65	4.82
» IV	5.25	3.69	5.36	7.43
» V	6.08	5.23	4.62	8.12
Teucrium scorodonia	4 leaves dev.	6 leaves dev.	12 leaves dev.	
Plant dev. at ill. II	4.23	4.51	7.11	—
» III	7.21	8.00	9.24	—
» IV	6.06	6.09	9.58	—
» V	6.90	6.07	7.45	—

Considering first *Pisum sativum,* here again as in the previons table. the classes IV and V ran fairly well together, class III presented considerable fluctuations according to its stage of development, and in the flowering stage actually had a higher assimilating energy than the group IV-V. In class II the assimilating energy was always low. Turning to *Teucrium scorodonia,* the outstanding feature of the table was the high assimilating power of class III which surpasses that of the group IV-V in each stage, while the assimilating energy of class II was also comparatively high especially in the last stage. Thus the conclusion may be drawn that a leaf developed in shade can exhibit a higher assimilating energy in direct sunlight than a leaf developed in sunlight and the writer attributes this to the increased chlorophyll content.

5) *Complementary Experiments:*

Assimilating Energy of plants developed under different degrees of light intensity when exposed to a low illumination.

	CO_2 gram-hour
Plant developed at ill: I lested at ill. I	2.27
» » » V » » » »	1.04
» » » II » » » II	2.48
» » » V » » » »	0.73
» » » III » » » III	7.13
» » » V » » » »	5.92

The experiments were carried out with adult plants of *Teucrium scorodonia* and showed that plants developed in full light were at a great disadvantage when transferred to shade compared to those developed in the shade, or in other words emphasised the adaptive modifications which the shaded plants had undergone.

The results given under the headings 3) and 4), though not absolutely comparable, would suggest that plants developed in low light intensities increase their assimilating energy when transferred to sunlight, and a last set of experiments was planned to see whether the supposition held good in the extreme case where leaves of a plant developed in illumination I were tested simultaneously at illuminations I and V:

	CO_2 gram-hour
Plant developed at I and tested at I	1.99
» » » » » » V	1.11
» » » V » » V	6.00
» » » V » » I	1.04

The results show that when the light intensity is reduced to $^1/_9$, the assimilating energy is very low — i. e. $^1/_3$ of that of the plant developed and tested in sunlight — but the adaptation has been carried to such a point that the leaf is unable to profit by the increased illumination when placed in direct sunlight, yet it is more active in illumination I than a leaf developed in illumination V. An analogous effect is obtained when young plants are transferred to increased light intensity and it is probably due partly to lack of protective tissues and partly to deeper causes depending on the activity of the protoplasm itself.

In conclusion the general results show that plants have the power of modifying their stucture and chlorophyll content within their individual limits of adaptability, so that, under natural conditions, their assimilating power tends to remain constant through the different light intensities.

923 - On the Penetration of Different Forms of Nitrogen in Plants: Adsorption Phenomena, Influence of the Nutritive Medium. — CHOUCHAK, D. in *Comptes Rendus de l'Académie des Sciences*, Vol. 159, Nos. 22 and 23, pp. 1696-1699 and 1784-1787. Paris, June 2 and 9, 1913.

The writer shewed in his previous work (1) that the absorption of nitrogen by plants was dependent on the concentration of the solution in contact with their roots, and he then proceeded to extend his investigations by studying the effect of using different compounds of nitrogen. In the course of the experiments it was noticed that the roots of some young plants which had been killed by contact with magnesium sulphate had not lost their power of absorption; the following trials were therefore planned to embrace both live and dead roots.

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(1) Se No. 235, *B*. March 1913. (*Ed.*).

125 wheat seedlings 3 to 4 weeks old were selected and their roots were removed ; these were carefully washed in distilled water and plunged into 100 c. c. of various solutions containing known quantities of nitrogen. Others which had been killed by immersion for half an hour in boiling water were similarly treated. The equilibrium of the solutions was immediately disturbed, and after 10 minutes the roots were removed and the solutions were analysed. The results are given below :

Solutions	NH_4 Cl.		Na NO_3		Glycocol		Tyrosin	Hydroxylamine Chloride
Nitrogen originally present in the solution: mgm.	0.5	1.0	0.5	1.0	0.5	1.0	0.5	0.5
Nitrogen absorbed by living roots: mgm. .	0.091	0.182	0.053	0.105	0.042	0.075	—	—
Nitrogen absorbed » dead » »	0.10	0.20	0.055	0.108	0.075	0.153	0.146	0.043
Nitrogen per kilo of dead roots . .	11.7	23.4	6.45	12.7	8.8	18.0	17.2	5.1
Nitrogen per litre of the solution at the end of the experiment with dead roots.	4.38	8.76	4.8	9.7	4.6	9.2	3.9	5.9
Coefficient of distribution $\frac{\text{Concentration in root}}{\text{Concentration in sol.}}$	2.68	2.68	1.34	1.32	1.92	1.95	4.35	1.02

The amount of nitrogen absorbed varies considerably with the nature of the compound in which it is present, and while both live and dead roots absorb approximately equal quantities of nitrogen when presented under the form of ammonium chloride and sodium nitrate, the dead roots absorb a larger quantity when it is presented under the form of glycocol. Further, when the writer compared the amount of nitrogen per unit weight in the dead roots and in the liquid which surrounded them at the end of the experiment, he found that the roots were richer in every case, the ratio or coefficient of distribution rising to over 4 in the case of tyrosin. From this he concluded that the nitrogen must have been *adsorbed* by substances contained in the roots. When the roots were transferred to distilled water, the adsorbed nitrogen was gradually lost, but whereas the power to fix a fresh quantity seemed unaffected when the roots were replaced in ammonium chloride or sodium nitrate, it was greatly diminished when they were replaced in glycocol and tyrosin. Again, by treating the roots with boiling alcohol the adsorbing power was attenuated with regard to ammonium chloride but unaffected with regard to sodium nitrate. In this latter case, however, the power was restored by macerating the roots in an alcoholic extract of fresh roots, showing that the adsorbing substance, though insoluble in boiling water, must have been dissolved by the alcohol.

For a particular compound the adsorption was proportional to the concentration of the solution in contact with the roots, as shown by the following figures:

Initial concentration, in mgm. per litre	5	25	50	100	200	250
Nitrogen adsorbed, mgm	0.074	0.36	0.74	1.48	2.5	2.75

When these were plotted they formed a curve strictly analogous to that obtained when dealing with the absorption phenomena of live roots.

In the next set of experiments the effect of adding various salts to the nutritive fluid was studied. The dead roots of 75 plants were immersed for 10 minutes in solutions containing 5 mgm. per litre of nitrogen in the form of ammonium chloride and 0.4 gm. per litre of each of the salts given below. The live roots of 145 plants were immersed for 70 minutes in solutions containing 0.25 mgm. of nitrogen per litre and 1 gm. per litre of the various salts:

	NH_4 Cl	NH_4 Cl + Mg So_4	NH_4 Cl + Na_2 So_4	NH_4 Cl + Mg Cl_2	NH_4 Cl + Ca Cl_2	NH_4 Cl + Ca So_4	NH_4 Cl + Na_2 Co_3	NH_4 Cl + Na Cl
N adsorbed by dead roots	100 (0.06 mg).	0	7.5	23.2	31.5	37.0	42·0	82.0
N absorbed by live roots	100 (0.127 mg.)	8.2	28.0	32.0	48.0	55.0	—	64.5

In the case of the live roots it was observd that if the solution were shaken the rate of absorption became constant after 10 to 15 minutes, while in the case of the dead roots some preliminary trials showed that the equilibrium of the solution was not disturbed immediately, as when ammonium chloride alone was used, but only after a period of time which varied with the nature and concentration of the added salt.

The salts affect both absorption and adsorption, and the figures, though different, run in the same order for the two classes of phenomena, which must be intimitely connected with one another. Analogous results were obtained with sodium nitrate, but in this case magnesium sulphate and sodium chloride accelerated instead of retarding the absorption and adsorption processes. Where two or more salts were used simultaneously they seemed to neutralize one another's effect to a certain extent, as shewn by the following adsorption experiments.

Solution containing per litre		Nitrogen adsorbed in mgm.
10 mgm. NH_4 Cl + 300 mgm. Na_2 So_4		100
» »	+ 40 mgm. Na Cl	104
» »	+ 80 mgm. »	123
» »	+ 120 mgm. »	111
10 mgm. NH_4 Cl + 200 mgm. Na_2 So_4		100
» »	+ 40 mgm. Mg So_4	111
» »	+ 80 mgm. »	120
10 mgm. NH_4 Cl + 400 mgm. Na_2 So_4		100
» »	+ 40 mgm. Ca So_4	127
» »	+ 80 mgm. »	115
» »	+ 120 mgm. »	110

With live roots similar absorption results were obtained and the increased nitrogen fixed by the plant under these conditions may account in part for the beneficial effect often produced by dressings of sea salt, gypsum or manganese sulphate.

The writer sumarises his conclusions as follows : when roots are put into a nitrogenous solution, the nitrogenous substance is distributed between the water and the superficial layers of the root in certain proportions (coefficient of distribution), which are readily modified in either direction by changes in the external medium, such as the addition of salts to the water. Once a state of equilibrium has been established, the rate of diffusion in the root then becomes proportional to the difference of concentration between the superficial and the deeper layers of the root.

924 - **The Occurrence of Barium in Tobacco and Other Plants.** — MC HARGUE, T. S. (Chemical Division of the Kentucky Agric. Exp. Station, Lexington, Ky.) in *Journal of the American Chemical Society*, Vol. XXXV. N° 6, pp. 826-834, Easton, Pa, June 1913.

A number of barium determinations were made on 17 samples drawn from various parts of the tobacco plant and 24 samples of various parts of other plants as well as on 4 samples of mineral matter (limestone, coal, and soil).

From the results he obtained as well as from those obtained by previous investigators the writer concludes :

1). That barium in small amounts is widely disseminated through rocks, soils and plants.

2) That in tobacco a plant whose barium content has not been previously reported upon, the barium varies from the normal content of other plants, both wild and cultivated (0.009 per cent. as barium sulphate in the stalk of the dry plant) to approximately twice (0.074 per cent. as barium sulphate in the leaf of the dry plant) the maximum reported (0.43 per cent) in "loco weed " (*Astragulus mollissimus* Torr., *Astragalus* sp. and *Oxytropis Lambertii* Push) whose toxic effect on cattle is attributed by some authors to its barium content.

3) That some of the barium occurring in tobacco can be extracted by distilled water and is probably in combination with organic acids.

4) That the occurrence of barium in the live cells of the higher plants suggests that possibly this metal may function in metabolism.

925 - **Chemical Researches on Cacao Seeds.** — REUTTER L. in *Comptes Rendus de t'Académie des Sciences*, Vol. 156, No. 24, pp. 1842-1844. Paris; June 16, 1913.

The writer has isolated from cacao seeds a white substance formed of microscopic rectangular crystals, soluble in water and to which he has given the name of Cacaorina. This substance which is obtained by the spontaneous crustallization of an alcoholic extract of the seeds treated with hot dilute methyl alcohol, can be decomposed by hydrolysis into theobromine and Cacao Red, and the latter substance, when treated with water slightly acidified by the addition of sulphuric acid, dissolves in its turn and gives rise to a dexter-rotatory sugar, and a new substance named by the writer, Cacao Brown on account of its colour.

Cacao seeds therefore contain cacaorina, (which, on decomposing, forms theobromine) glucose, cacao red and cacao brown.

PLANT BREEDING

926 - **An Unfixable Dwarf Race of Wheat.** — DE VILMORIN, P. in *Journal of Genetics*, Vol. 3, No. 1, pp. 67-76. Cambridge, June 1913.

" Shirno " wheat originated in 1886 from a cross, and has been cultivated ever since at Verrières proving itself a perfectly fixed and stable white variety. In 1902 a dwarf plant was noticed in the population and its descendance was carefully studied. Seed was annually saved from dwarf plants, but a pure dwarf race has never been isolated, the progeny of such plants consisting always of a mixture of tall and dwarf plants in the proportion of 1 tall to 2 to 3 dwarf. A dwarf red Shirno was obtained as the result of an accidental cross with a red variety and though the colour character became fixed the size character behaved exactly as it did in the white strain. A third example of an unfixable dwarf race was provided by a Beseler's Brown Club Head which produced a dwarf in 1905. In all three cases tall plants issuing from dwarf plants have never produced anything but tall descendants.

The phenomenon is somewhat analogous to that of inheritance in yellow mice recently studied by Miss Durham (1) and the evidence points to its being a case where the gametes bearing the dominant character may unite but never develop into a new individual, for if there were repulsion between the gametes, with an unlimited supply of pollen, the proportion of dwarf to tall should be 3 to 1 whereas it is nearer 2 to 1. The writer counted the number of grains on the respective ears and found that while the tall ears averaged 59, the dwarf only averaged 50, but no differences between tall and short were observed, either in germination power or in vigour of the plant, indicating that if the theory of a non-viable pure dominant were correct the death must occur before the seed stage was reached. The non development of the pure dominants would also account for the ration dwarf to tall being always above 2, for where one grain fails in a spikelet, its place is frequently taken by another from the centre of the spikelet which would otherwise remain sterile.

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(1) F. M. DURHAM. Further Experiments on the Inheritance of Coat Colour in Mice *Journal of Genetics*, Vol. 1. No. 2, pp. 166. Cambridge, 1911.

927 – **Preliminary Report on Effect of Close and Broad Breeding on Productiveness in Maize.** Montgomery, E. G. in *Twenty-fifth Annual Report on the Nebraska Agricultural Experiment Station*, pp. 181-192. Lincoln, Nebraska, 1912.

Self fertilization being injurious to maize, the question arises as to whether it is advisable to use a single ear as a foundation stock or whether a number of ears should be crossed in order to maintain the yield. A series of experiments to test the point were begun at the Nebraska Experiment Station in 1909, and the results of the first three years' work, are given in this preliminary report.

The plants are grown under the following conditions :

I. Selfed.

II. Each ear is fertilized by the pollen from 10 to 15 sister plants, but the strain is carried on from year to year by the progeny of one single ear.

III. As II, but the strain is carried on from year to year by sowing a composite sample from 10-15 ears..

IV The plants are detasseled to ensure cross fertilization from another strain ; but as only four strains were originally used in the experiment, these have now lost their identity and the experiment has become a test of detasseled plants.

V. Six ears are selected annually from the best of six rows, and sown the following season, one ear to a row.

VI. Seed is secured each year from a corn crop grown under ordinary field conditions — that is to say that the farmer who produces it was originally provided with pedigree corn and has since saved the best ears of his crop each year for sowing the following season.

The yields obtained in 1911 are given below :

I.	9 90	bushels	(of 56 lbs)	per	acre
II.	37 66	»	»	»	»
III.	41 30	»	»	»	»
IV.	45 89	»	»	»	»
V.	44 02	»	»	»	»
VI.	40 70	»	»	»	»

The results show that all degrees of close breeding between nearly related strains are injurious, for the classes II, III, and IV are beginning to exhibit signs of lack of vigour, which will become more prounonced every year. As a results of selfing, Class I has already produced several distinct types, which are apparently perfectly pure.

928 - Selection of Maize on the Estate of Ruma in Hungary. — FLEISCHMANN, RESZÖ in *Közleck*, Year 23, No. 47, pp. 1694-1697. Budapest, June 21, 1913.

Since 1909 the estate of Ruma (Szerem county) has been occupied with the improvement of field crops by rational selection. The first work was with wheat; maize was taken up later. The variety used was Horsetooth, which has been grown on the estate for a good time, and already, when the work was begun, showed a number of types, differing both in botanical characters and in time of ripening.

The selection system is divided into two parts:

1) Preliminary examination, in which the descendants of the selected plants are submitted to botanical analysis.

2) True selection, consisting in rigorous genealogical selection of the plants approved at the preliminary examination, and their gradual improvement.

For the first part of the selection, a large number of plants showing the desired characters are selected on the field when ripe in autumn. These plants are brought to the laboratory for botanical examination, and those not approved are discarded; the remainder are registered. All the following points are considered, both for the parent plants and for their descendants:

Whole plant: height; amount and uniformity of unit yield; precocity; depth of the grain cavity in the ear; rapidity of growth; small number of sterile shoots.

Ear: rows straight and close, with at least 14 grains in each; cylindrical form of the ear; proportion of rachis to whole ear — should be less than 14 per cent.

Grains: colour and evenness; 100-grain weight (over 30 gms., and should weigh over 56 lbs. per Imp. bushel); power of germination (should be over 96 per cent).

After this examination, the grains of the parent plants are sown separately in the trial garden for examination of their offspring. The treatment of the garden soil is similar to that given under field conditions, so that the plants undergoing selection may be treated like those from the fields. Only half the grains from each ear are sown (besides which the ones at each end are discarded), the other half being left in the cob till the following year in tin boxes.

The arrangement of the plots is shown on page 1217. It will be seen that the grains of each selected ear are sown on three different plots; the number of plants is the same for each. These parallel sowings make the control of the daughter-plants more exact, and show the influence of irregularities of soil. The results (taking the average of the three plots) obtained by the examination of the first generation give the first indications as to which of the daughter plants are worth selection. The best of these are then submitted to true selection.

After the first year, all the descendants of the élite types are available and the most perfect of them are chosen to be fresh parents, and the grains are stored in a tin box; all this forms the material for the second part of the process.

The stored grains are sown separately on the same plan; but the weakest are eliminated beforehand on the previous year's results, so that the influence of their pollen on neighbouring ears may be avoided. The multiplication of the élite plants is carried on at the same time on other plots, till they are ready for field cultivation.

If an élite strain is approved by several years' trial, and found free from all faults, it is then submitted to further genealogical selection, with a view to fixing its qualities; for this process, its grain is sown again separately, and once more the best descendants are selected.

From this process the following observations may be drawn:

1) By choice of different types and genealogical selection, élites may be created whose yields differ considerably, and which transmit their characters to their offspring.

2) The different descendants of one parent plant are not of equal value, owing to cross-fertilization. Examples are given by the figures for the élite types 122-1 and 122-2, and those for their parent, obtained in the preliminary selection of 1911 and the first generation following (see Table II).

3) From this practical selection the following conclusion may be drawn: as the innate qualities of an ear undergoing selection cannot be recognized for certain, its improvement is not yet fixed in the selected ears of the first generation. Artificial crossing must therefore be used; that is to say, the offspring must be controlled for several successive generations, so that the subsequent selection may be carried out on the most nearly analogous individuals, and the superior qualities of the types recognized as best may be fixed.

This method is illustrated clearly by the genealogical tree of the élite type 122, which was constantly better than the other types chosen. The following is the explanation of the signs used:

◫ = ear of élite whose grain was divided;
△ = first filial generation, occupying three rows in the trial garden;
◺ = second filial generation, occupying rather over ¼ acre (¼ arp.) in the plot garden;
□ = third filial generation, occupying 25 to 50 acres in the field,

This genealogical tree and the tables give a good idea of the system of selection followed at Ruma. Experience has shown that the cross-fertilization between the élite types sown near together does not make any appreciable difficulty if they are grouped carefully, keeping apart those with contrasting characters.

TABLE I. — *Arrangement of the rows of a 1st generation gronp.*

(Distance apart of the plants: 28 ½ by 16 ½ iaches).

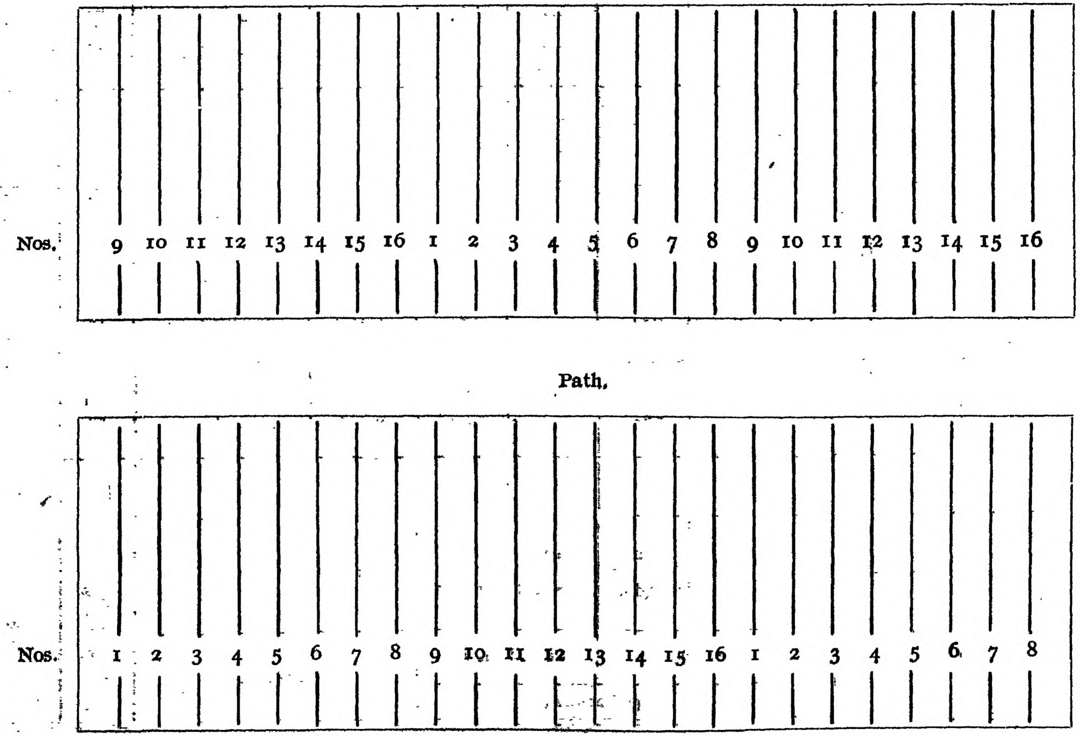
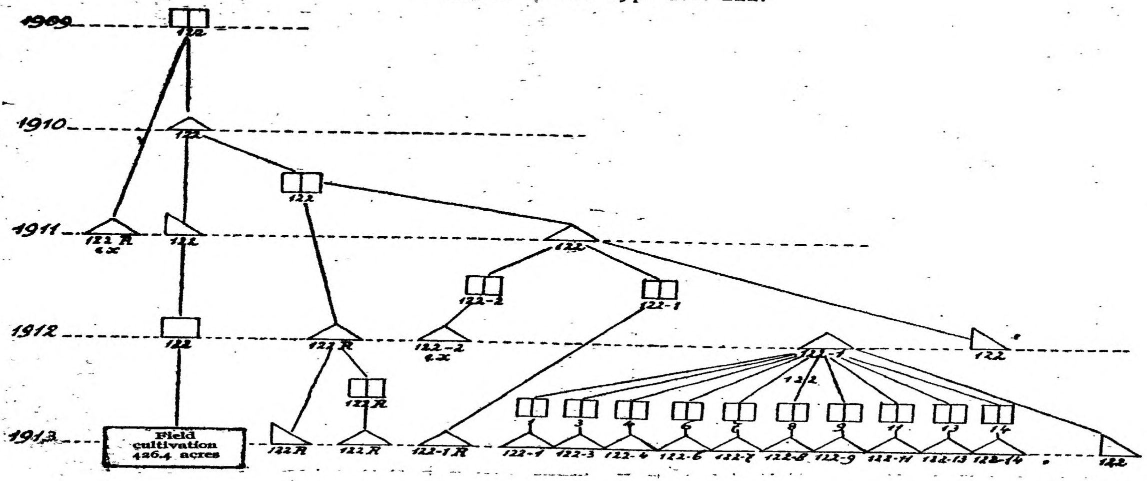

Nos.
9 10 11 12 13 14 15 16 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Path.
Nos.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 1 2 3 4 5 6 7 8

TABLE II. — *Average annual yields.*

Year	No.	Stage of multiplication	Cultivation		Average yields.				Difference of No. 122 in % of average of the group		Remarks
			Place	Area	of the group		of No. 122		+	—	
					per plant: gm.	per acre: lbs.	per plant: gm.	per acre: lbs.			
1909	122	□□	—	—	179	—	190	—	6.1	—	First parent plant
1910	122	△	trial garden	3 rows	208	—	249	—	19.7	—	
1910	122	□□	—	—	242	—	288	—	19	—	Parent plant.
1911	R 122	△	trial garden	3 rows	121	—	138	—	14	—	Further trial stopped owing to proportion of rachis to ear (16.7 %) being too large.
1911	122	△	trial garden	3 rows	121	—	125	—	3.3	—	
1911	122	◺	plots garden I.	—	—	3690	—	3880	5.4	—	
1911	122—1	□□	—	—	195	—	226	—	15.8	—	
1911	122—2	□□	—	—	195	—	178	—	—	8.7	
1912	122—1	△	trial garden	3 rows	194	—	213	—	9.7	—	
1912	122—2	△	» »	»	194	—	170	—	—	12.3	Discarded.
1912	R. 122	△	» »	»	194	—	209	—	7.7	—	
1912	122	◺	plots garden II	—	—	5250	—	5820	10.8	—	
1912	122	□	field	—	—	4330	—	5030	16.0	—	

Pedigree of élite type No. 122.



1909
1910
1911
1912
1913
122
122 R 6x
122-2
122-1
122-2 6x
122 R
122-1 R
12/2
Field cultivation 426.4 acres
1
3
4
6
7
8
9
11
13
14
122-1
122-3
122-4
122-6
122-7
122-8
122-9
122-11
122-13
122-14

929 – **The Inheritance of Certain Forms of Chlorophyll Reduction in Corn (Maize) Leaves.** EMERSON, R. A. in *Twenty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 89-105. Lincoln, Nebraska, 1912.

The writer gives an account of his experiments on variegated maize plants. He found seven different kinds of chlorophyll reduction, graduating from a complete lack of chorophyll, and apparently also of plastids, to an inconspicuous white streak on the leaves. The knowledge of the interaction of the various forms is still very incomplete. Where the different types have been carefully studied, they have been shown to be Mendelian recessives to normal colouring.

930 – **The Inheritance of the Ligule and Auricles of Corn (Maize) Leaves** EMERSON, R. A. in *Twekty-fifth Annual Report of the Nebraska Agricultural Experiment Station*, pp. 81-88, Lincoln, Nebraska, 1912.

A family of maize lacking both ligules and auricles was first noticed by the writer in 1910, when 17 descendants of a self-pollinated plant grown the previous year exhibited the peculiarity. The general circumstances indicated that the two characteristics constituted together a single Mendelian factor, which was recessive, and subsequent breeding experiments entirely confirmed the hypothesis. The inside of the sheaths of the liguleless maize were more frequently discoloured as from incipient decay, than normal leaves, which may possibly indicate a useful function of the ligule

931 – **Influence of «Pickling» on the Germination of Cereals** (1) JOHNSON J. C. in *Journal of the Board of Agriculture*, Vol. XXII, No. 2, pp. 120-124. London, May 1913.

A series of experiments was carried out at University College, Cork, using formaldehyde and copper sulphate solutions of different strengths, and varying too the period of immersion of the seeds. The germination was carried out in clean sand and no trouble was experienced with moulds or parasites of any sort. Some seeds were washed after immersion, while others were not, but this treatment apparently caused no appreciable effect.

Wheat steeped for 15 minutes in a 0.25 per cent solution of formaldehyde germinated 80 per cent. and gave the same result when steeped for 5 minutes in a 2 per cent copper sulphate solution. Barley and oats were still more resistant, but the writer recommends in practice 0.125 per cent formaldehyde solution for 15 minutes and 0.5 per cent copper sulphate solution for 12 hours for general use or 1 per cent solution for 6 hours for barley and oats. On comparing the two series of experiments, it was seen that copper sulphate retarded germination about twice as much as formaldehyde.

932 – **Quality of Sugar-Beet Seed.** — URBAN, J. (Experiment Station for the Sugar Industry at Prague). *Zeitschrift für Zuckerindustrie in Böhmen.* Year XXXVIII, Part. 3, pp. 444-448. Prague, June 1913.

As a result of trials made in 1911 and 1912, the writer concludes, in agreement with previous experiments, that beet seeds preserve the same quality for several years; consequently a beet seed whose hereditary character is to give rich beets will show this property in any year and in any soil.

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(1) See also No. 797, *B.* July 1913, (*Ed.*).

933 – Notes on Pollination and Cross-Fertilization in the Common Rice Plant.

CEREAL AND PULSE CROPS

HECTOR, G. P. in *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. VI, No. 1, pp. 1-10. Calcutta, June 1913.

A number of the varieties of rice cultirated in the districts of Lower Bengal have been grown on the Dacca farm during the last two years, wth the object of studying their character in single plant cultures, and of ascertaining to what extent, if any, natural cross fertilization takes place. References are given to previous work on the subject together with the chief conclusions drawn by other investigators. The single-plant cultures of cross-fertilized plants provided material for studying the inheritance of certain characters. The writer summarizes his conclusions as follows:

" 1) In Lower Bengal, under favourable conditions, cross-fertilization may take place in rice to an extent which may be provisionally estimated at about 4 per cent. " (This confirms the most recent work of Fruwirth and van der Stock).

" 2) This cross-fertilization takes place wholly through the agency of wind and would seem to be effective only between flowers of adjacent plants to a radius of a few feet.

" 3) As regards certain characters at least, *e. g.* grain colour, segregation along Mendelian lines appears to take place.

" 4) So long as seed of a variety is kept free from accidental mixture, there is no risk of contamination from cross-fertilization, but if seed gets mixed, cross-fertilization will undoubtedly take place between adjacent plants in a plot, and to an extent sufficient is a few years' time to reduce a variety to a number of splitting types. Hence the imperative necessity of taking every precaution to keep seed of varieties free from accidental mixtures. "

934 – The Cultivation of Rice with the Help of Machines (1).

— F. MAIN in *Journal d'Agriculture Tropicale*, Year 13, No. 143, pp. 129-133. Paris, May 31, 1913.

The writer deals with the experiments carried out in 1912-1913 and superintended by Mr. Alazard, engineer to the Indo-Chinese Rice Growing Association. The results of these trials were as follows:

The small hand-sower proved satisfactory in spite of the inexperience of the native labourers; 0.6 of an acre can be sown in one day, and the rice is distributed in small holes in rows 12 to 16 in. apart and 14 in. apart in the rows. As soon as the grain was up, a marked difference was noted between the parts of the field where the seed had been sown and those where it had been transplanted in the usual native manner. The necessity for sowing on clean land became evident as hoeing was a difficult process on the submerged soil. But whereas the sown rice did not suffer from a sudden rise of the water the transplanting operations had to be interrupted. The sown crop came into ear earlier and gave every promise of an excellent yield.

The crop was harvested in two different ways in order to compare the results obtained by transplanting and direct sowing:

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(1) See No.1612 *B.* Dec. 1912, and No. 121 *B.* February 1913. (*Ed.*)

1) A reaper and binder was used to collect the crop sown or transplanted on to 1 hect. (2,47 acres) of ploughed land.

2) The crop, sown or transplanted on to 1 hect. of unploughed land, was harvested by hand.

The reaper acted as well as the circumstances permitted and Mr Alazard deduced the following conclusions from the experiment: Rice selection should be practised in order to obtain a variety with rigid straw which will not lodge easily, and a grain which will ripen more uniformly.

3) Mechanical harvesting is a very easy operation. A binder works well, provided its pace is sufficiently rapid. In the Thai Lai ricefield, where the experiments were made, the soil was dry enough to allow of the passage of a four ton tractor. The following are the results of the harvest:

Rice sown on ploughet land	1 tons	16 ½	cwts per acre
Rice transplanted on ploughed land .	1 »	3 ½	» »
Rice sown on unploughed land	1 »	4 ½	» »
Rice transplanted on unploughed land	0 »	15	» »

The above figures show that mechanical cultivation of rice fields already yields positive results, and it will now be necessary to give the soil a better preparation for the crop and to arrange a system of irrigation which will facilitate hoeing operations.

935 - **Manuring of Broom Corn.** — 1. PETRINI L, *La coltivazione della saggina da granate nell'agro Fiorentino Pratese*, 67 pp. + 9 figs. Prato 1913. — 2. CARRÉ, A. La culture du sorgho à balais dans le Sud-Ouest de la France. *La Vie Agricole et Rurale*, Year 2, No. 20, pp. 567-570. Paris, April 19, 1913.

The cultivation of broom corn (*Sorghum vulgare* Pers., var.) is becoming increasingly important. This crop is grown particularly in Northern and Central Italy, the South West of France, Turkey, Austria-Hungary and latterly Tunis (1).

The question of the manuring of broom corn is of special importance, but has not yet been sufficiently studied. Broom corn is a gross feeder, and its period of growth is generally short; it therefore needs a large amount of nutritive material, particularly phosphoric acid and potash, in a rapidly assimilable form. According to Prof. Passerini, a crop of 44 bushels of grain and 56 cwt. of straw of common sorghum would take out of an acre of land:

Nitrogen	46.7 lbs.
P_2O_5	63.2 »
Potash	81.4 »

Sig. Petrini undertook experiments on broom corn, particularly as to manuring, on a Royal property in the commune of Prato.

The plan and results of the experiments are shown in Table I.

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(1) In recent years this crop has also been taken up in North America and Australia. — See *The Broom Corn Review*, Wichita, Kansas; also G. MARKS: Broom Millet, *Dept. of Agric., New South Wales, Farmers' Bulletin No*) 20 (2nd. ed.), August 1911, (*Ed.*).

TABLE I.

Plot			1	2	3	4	5
Area		sq. yds.	840	840	840	840	840
Substances left by previous crop of swedes	Nitrogen	lbs.	10.1	10.1	10.1	10.1	10.1
	P_2O_5	»	7,25	7,25	7.25	7,25	7,25
	Potash	»	8.5	8.5	8.5	8.5	8.5
Manuring	Farmyard manure	lbs.	3085	3085	3085	3085	3085
	Nightsoil	»	4630	—	—	—	—
	Superphosphate	»	—	92.5	92.5	92.5	92,5
	Nitrate	»	—	23	—	23	—
	Sulph. of ammonia	»	—	—	23	—	23
	Sulphate of potash	»	—	—	—	20	20
Cost of manuring		s-d	16–4	14–9	15–7	16–6	17–0
Straw: weight		lbs.	9740	8460	9015	8760	8880
Value		s-d	33–7	35–6	38–9	35–5	36–4
Grain: weight		lbs.	473	462	461	419	482
Value		s-d	21–7	21–1	2–11	19–2	22–0
Substances left after the crop	Nitrogen	lbs.	+ 56.3	+ 15.6	+ 18.8	+ 17.4	+ 15.9
	P_2O_5	»	+ 6.75	+ 17.9	+ 17,0	+ 16.7	+ 12.5
	Potash	»	+ 3.05	— 4.5	+ 1.95	+ 9.3	+ 2.9

The net gain per acre from the manuring would have been :

	£	s	d
Plot 1	12	16	7
» 2	12	0	5
» 3	11	16	6
» 4	11	4	2
» 5	10	19	2

It should be noted that plots 4 and 5 were under water for some time. These experiments show the great advantage of giving suitable dressings of artificial manures on top of a good organic manuring. The effect of phosphatic manuring is evident ; nitrogen gives better results as ammonia than as nitrate, though nitrate of soda is of great value if the plants are very weakly. The advantage from potash is noticeable but not very large.

As a result of these considerations, the writer recommends for broom corn an abundant manuring, particularly to avoid exhaustion of the soil; the best treatment would be a foundation of farmyard manure with bone superphosphate, sulphate of ammonia and sulphate of potash.

M. Carré has made manuring experiments on land of moderate fertility in the Haute-Garonne. The yields, calculated per acre are given in Table II.

TABLE II.

Plot	Manuring	Grain		Straw		Total value of crop
		bu.	£ s d	cwt.	£ s d	£ s d
1	Unmanured	50	5 15 6	8 3/4	5 6 0	11 1 6
2	Farmyard manure, 7½ cub. yds.	68	7 16 9	12	7 4 6	15 1 3
3	As 2, + 450 lbs. superphosphate at 14 to 16 %	72	8 7 0	14 ½	8 13 6	17 0 6
4	As 3, + 135 lbs. nitrate of soda	72	8 7 0	14 ½	8 13 6	17 0 6

That farmyard manure is valuable is shown by these experiments also; nitrate of soda is not necessary except in rainy seasons; phosphatic manure always gives good results to complete the action of farmyard manure; though it may not always increase the weight of the crop, its effect on quality is marked, so that both the grain and the straw fetch higher prices.

In conclusion, it may be stated:

1. *The basis of manuring for broom corn should be dung.*

2. *The necessary element besides is phosphoric acid, which tends specially to improve the quality.*

3. *Minerat nitrogen and potash may be of use in some cases.*

E CROPS

936 – **The Development of Cotton Growing in British Possessions.** *The British Cotton-Growing Association: Eighth Annual Report,* pp. 1-36; and. *Cotton Growing in the Anglo-Egyptian Sudan,* pp. 1-61. Manchester, 1913.

The British Cotton-Growing Association was incorporated for the purpose of developing the cultivation of cotton in the British Possessions. In its 8th Annual Report the Association gives an account of the work done in 1912,

In West Africa, most satisfactory progress is reported from Northern Nigeria (1), and good progress from Lagos, where ultimate success will apparently depend on the introduction of high-yielding varieties, but the experiments in the Gold Coast have not been promising and are only being continued on a small scale. In British East Africa the experiments in Jubaland are being discontinued, but Uganda shows most encouraging signs of development, and in Nyasaland the advances made to planters by the Association have largely contributed to the success of cotton in that country; the crop there, though liable to damage by unfavourable weather will undoubtedly undergo considerable extension, especially after the opening of the new railway between Blantyre and the Zambesi. In Rhodesia the Association is discontinuing some of its experiments, which will be carried on by the British South Africa Company, though it continues its advances to planters; but no great progress is reported from this country or from South Africa.

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(1) See No 667, *B.* June 1913. *(Ed.).*

It is the Anglo-Egyptian Sudan which holds the great promise of future development in cotton cultivation. In January and February 1912 a deputation from the Association visited the Sudan and subsequently presented a report to the Council on the possibilitics of cotton growing in that country, the main conclusions of which are in complete accord with those of Mr. Arno Schmidt in his report presented to the International Federation of Master Cotton Spinners' and Manufacturers' Associations (1).

The result of the British Cotton-Growing Association's work has been to show where the chief developments in cotton growing may be expected and its efforts in future will be concentrated on those districts which have shown themselves best adapted to the crop.

937 – **Cotton-Growing Experiments in Sicily in 1912.** BARZI, A. in *Bollettino del Ministero di Agricoltura, Industria e Commercio,* Year, XII, Series C., Parts 2-3-4, pp. 45-50. Rome. February, March, April 1913.

The writer draws attention to the fact that, owing to the injury caused to the bean crops by *Orobanche speciosa,* it is advisable to grow cotton in the place of these legumes, and he enumerates the advantages to be obtained by reintroducing the crop in Sicily. He points out that cotton, cultivated as a summer crop is of great importance in the rotation, for it does not exhaust the land and necessitates repeated hoeings which prepares the soil for wheat. Further, though cotton does not increase the stock of nitrogen in the soil like beans, it scarcely removes any of this compound; moreover it should not be forgotten that cotton cakes form an excellent cattle feed and might be substituted for summer forage which is very scarce in Sicily.

The fertilizing experiments described by the writer were carried out on land belonging to the Colonial Gardens for the purpose of determining the effect of different manures. This land is well adapted to such experiments, as the soil, both in its mechanical and chemical composition, is typical of Sicilian soils suitable for cotton growing.

The conclusions drawn are as follows:

Nitrogenous manures, considerably increase vegetative growth, but cause the crop to ripen later. They are to be recommended in the case of poor soils, hot climates, and very early varieties of cotton which exhibit more lateral development than growth in height. The soils of Sicily are nowhere poor enough to necessitate the use of nitrogenous manures especially as the latter have a bad effect upon the technical qualities of the lint.

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(1) See No. 801, *B.* July 1913. (*Ed.*).

Phosphatic and potassic fertilizers cause the crop to ripen earlier and increase the weight of the lint. Their influence on vegetative growth, is negligible compared to that of nitrogenous fertilizers. The crop being riper is more easily harvested, and the manures also raise the quality of the lint. Phosphatic compounds are only efficacious if they are applied before the rainy season.

Effect of the different fertilizers upon the technical quality of the lint.

The following table shows that early maturity and high yield are connected with the quality of the lint. Many factors influence these three coefficients, upon which the success of cotton-growing depends, viz: the nature of the soil and climate, the distribution of the rainfall, light intensity, choice of varieties, fertilisers and the time of topping. The improvement of acclimatized varieties and the acclimatization of better varieties depend on all these factors which are, to a certain degree, capable of modification.

The results of the experiments in question only refer to one of these factors; but they allow of rules being drawn up as to the choice of fertilizers.

The effect of the different fertilizers upon the technical qualities of the lint.

Variety	length in mm.			Homogeneity	Colour	Resistance
	Nitrogen	Phosph. Acid	Potash			
Sea Island	33	35	35	good	white	good
Upland 2	24	24	24	»	»	»
Sea Island Biancavilla	24	25	24	bad	»	»
Mississipi	28	29	28	»	»	»
Biancavilla Caravonica	22	26	23	»	»	»
Erythrean	24	24	24	fair	»	»
Biancavilla Mit-Afifi	28	29	28	bad	dirty white	»
Simpkin's Early Prolific . . .	18	21	21	fair	white	»
Hastrovo	23	24	24	»	whitish	average
Horanghled King's	18	20	20	bad	white	»
Mit-Afifi	25	26	25	good	yellowish-brown	good
Caravonica Wool	36	38	37	fair	white	excellent
Upland No. 12	18	21	21	»	»	good

938 – ***Agave Lespinassei*** **(Zapupe Vincent).**— CALVINO M. in *La Hacienda*. Vol. VIII, Nos. 5-8, pp. 150-153, 182-185; 214-217, 248-250 + figs., Buffalo, N. Y., February-May 2913.

Prof William Trelease, Director of the Botanical Gardens, Saint Louis has classified the agaves producing textile fibres (zapupes) as follows.

1. *Agave Zapupe*, blue agave (zapupe azul) or Estopier agave (zapupe Estopier).

2. *A. Endlichiana* ('ixtle' or 'ixtle manso') which grows wild near Huastuco.

3. *A. aboriginum* (Zapupe silvestre, cimarron, « de Sierra Chontla) which grows wild between Tampico and Vera Cruz and is sometimes cultivated.

4. *A. Deweyana* ('Zapupe de Tantoyuca', 'Zapupe verde' which has a long vegetative period and large leaves, but the latter are brittle so that the variety is not cultivated.

5. *A. Lespinassei* (zapupe Vincent). The natives of the northern part of vera Cruz and of the districts round Tampico and Tamaulipas have utilized the fibre of certain agaves from very remote times, but the plant has only been cultivated since 1900. Mr. Estopier was the first to establish a plantation, and he began with blue agave at Tampico. In 1905, a second plantation was establised by Mr. Vincent in the island of Juana Ramirez (about 30 miles from Tampico in the canal between Tampico and Tuxpan). He also used the blue agave, but not exclusively and part of the plantation was stocked with a green agave which grew wild on the Island (Vincent agave). Blue agave had originally been chosen on account of its early maturity and thin fibres, but it subsequently proved to be shorter lived, and its fibre not only deficient in yield but also difficult to extract. The yield of clean fibre was only 2.75 per cent, while most agaves give 3 to 3.5 per cent, "Henequen of Yucatan" (*agave rigida*; syn. *A. sisalana*) 4 to 4.5 per cent, and Vincent agave 5.5 to 6 per cent. As a result Vincent agave is being substituted for the blue variety in the Juana Ramirez plantation.

The following data indicate the agricultural character of the various agaves :

	Age of plant when coming into bearing Years	Age of plant when flowering Years	No. of leaves harvested per annum	Fibre par leaf. oz.
Henequen of Yucatan . . .	6—7	14—15	30	1.4
Blue agave	2 ½	4—5	70	0.5
Vincent Agave	3	13—14	80	1.0

And in the next table are given results obtained by Professor Lister H. Dewey (in charge of fibre crops investigations, Bureau of Plant Industry, U.S. Department of Agriculture) working on Vincent agave.

Age of leaves	Mean resistance	Resistance per gramme-metre	Mean yield of fibre per leaf
2 ½ years	1 237,5 gm.	26 107,5 gm.	11,7 gm. (0.4 oz.)
3 »	1 422,0 »	29 329,0 »	15,0 » (0.5 oz,)
8-9 »	1 552,5 »	26 159,0 »	34,2 » (1.2 oz.)

Vincent agave is propagated: 1) by slips or runners which the parent plants begin to form 11 months after planting out; 2) by means of small bulbs formed on the floral spadix; 3) by seed. The best slips are those 6 to 7 months old and 8 to 12 inches long. Bulbs and seed are first sown in a seed bed, and transplanted after six months in the case of bulbs, and after one year in the case of seedlings. The plant flourishes on sandy marls, but would probably grow well on any soil with good drainage, and will adapt itself to any exposure so long as it is not shaded. It is usually planted in rows 10 feet apart and 3 feet apart in the rows which seems the most suitable spacing, but occasionally the plants are set out on the square 3 or 6 feet apart. By adopting the former method catch crops can be cultivated during the first 10 months and the writer recommends ground nuts (*Arachis hypogea*) for the purpose. Owing to their sandy nature, the soils on the northern coast of the state of Vera Cruz do not either dry out or crack during the rainless months, otherwise surface cultivations would be required. The sixth year, that is to say after the 3rd harvest, runners are left between the lines, one for each plant, destined to replace the parent plant when the latter has flowered. Cutting should not begin before the central bud and its surrounding leaves have attained their required length, otherwise the subsequent development of the plant is affected. The crop is harvested all/the year round, each plant furnishng 2 cuttings, and only those leaves which form an angle greater than 45° with the central bud are removed. At Yucatan it is customary to cut the floral spadix of "henequen" as soon as it attains a length of 18 inches thus obtaining a greater development of the last leaves, and the writer recommends that similar methods should be employed in the case of the Vincent agave.

Not more than 24 hours should elapse between the time of cutting and the beginning of the extraction process, otherwise the leaves are liable to fermentation and rotting.

The gummy fibre issuing from the defibrating mill is washed in hot water tanks heated by steam. and then dried, producing fibres of a reddish colour which is probably due to iron hydrate from the steam pipe. The fibre may be bleached by washing in cold water with soap (2 to 3 per cent of the damp fibre) and by subsequent rinsing in clean water. For certain purposes, the fibres are merely dried without any previous washing.

The stem and floral bud of old plants are cut at ground level, slit down the middle and baked for 16 hours in stone chambers which are sometimes below the level of the soil. They are then submitted to pressure to extract a juice which, when fermented and distilled, produces a liqueur containing 57 per cent of alcohol and known in the trade under the name of "Mezcal de San Carlos".

The writer gives the following balance sheet for the crop:

Expenses.

	£	s	d
1st. year.			
Value of 198 acres (80 hectares) of land at £2.1.3 per acre . .	408	7	6
Clearing and cleaning » » »	408	7	6
Buildings	820	0	0
Preparation of land for planting	246	0	0
Cost of 250 000 plants at £10.5.0 per thousand	2 562	10	0
General management	512	0	0
Total expenses at the end of the 1st. year. . . .	£4 957	5	0
2nd. year.			
Interest on capital involved at 6 per cent	297	7	3
General management	512	0	9
Total expenses at the end of the 2nd year. . .	£5 766	12	3
3rd *year.*			
Defibrating apparatus	716	15	8
General management	512	0	0
Total expenses at the end of the 3rd year . . .	£6 995	7	18

Receipts.

	£	s	d
3rd year.			
760 tons of fibre at £15.5.0 per ton	£11 590	0	0

As the estimates are only approximative, the writer did not take into account the receipts from the catch crop or from the sale of slips which are worth £10 6*s* 8*d* at the shipping port. The receipts for the 3rd year have been calculated on the basis that each leaf yields 1 oz of fibre, that the pulping machinery works 10 hours a day and that 100000 leaves are defibrated in that time, and that there are 250 working days in the year. The cost of extracting the fibre may be calculated from the following estimates.

	£	s	d
Cutting and transport of 60 000 leaves (allowing 2*s*. 0*d*, per 3 000 leaves for cutting by piecework)	2	16	0
Defibrating 60 000 leaves (piecework)	2.	3	6
+ cost of coal		6	0
Price of working 60 000 leaves or extracting 3 750 lbs of fibre	£5	5	6
Price per lb. of fibre	0.33*d*		

An equal sum must be allowed for freight, commission etc. The fibre is worth 2.7 *d* per lb on the New York market, leaving a net profit of 2.1 d per lb. on the cost of extraction (a lower figure has been taken in the above estimates in order to be on the safe side).

Mishaps in cultivation, fungoid and insect pests are not greatly to be feared in agave plantations - amongst the latter *Geodemis mexicana* ("tuza") and *Strataegus Julianus* may be mentioned.

GAR CROPS

939 - **Sugar Cane Experiments in Britich Guiana.** — (Agricultural conference, 1912). HARRISON, I. B. and others in *Weet Indian Bulletin*, Vol. XIII, No. 2, pp. 95-177, Barbados, 1912.

An account of sugar cane manuring experiments carried out at the Botanic Gardens in British Guiana during the 21 years 1891-1912.

The experiments were planned to provide information on the following points.

Questions	No. of replies
A. — Is nitrogen requisite in a sugar-cane manure? . .	48
B. — Is nitric nitrogen preferable to ammoniacal nitrogen?	24
C. — Is phosphoric acid requisite?	30
D. — Is potash of any use in this soil?	24

The "probable error" due to soil being reduced in the following proportions.

	Single plot Probable error por cent	Probable error per cent on average ol results. Questions.			
		A	B	C	D
1 st. Crop.	5.4	0.8	1.1	1.0	1.1
2 nd. »	7.0	1.0	1.4	1.2	1.4
3 rd. »	6.0	0.9	1.2	1.1	1.2
4 th. »	10.0	1.4	2.0	1.7	2.0
5 th. »	17.8	2.5	3.6	3.1	3.6
6 th. »	19.1	2.7	4.0	3.3	4.0

The plots, which numbered 91, were $^1/_{25}$ of an acre in area and divided into two sections. In 1901 another field was divided up into 96 plots of $\frac{1}{20}$ acre each, and in 1910 yet another was laid out into 144 plots of $\frac{1}{70}$ acre each. Preliminary experiments had shown that planting in rows 5 feet

× 5 feet apart gave a mean yield of 34.2 ± 0.7 tons per acre while rows 6 feet × 6 feet apart gave a mean yield of 27.8 ± 0.6 per acre; the former spacing was therefore adopted.

Nitrogenous manuring The first general result is that nitrogen in the form of sulphate of ammonia, nitrate of soda, nitrate of lime, calcium cyanamide, raw and dissolved guano, and dried blood, exerts a favourable action on the yield of the sugar-care, and is undoubtedly the manurial constituent which mainly governs the yield of that plant, and this applies to every variety of sugar cane which has been under trial. When nitrogen is applied in dressings not exceeding 40 to 50 lbs per acre there is practically no difference between the effects of ammonium sulphate, dissolved guano, and nitrate of soda in normal years ; but as a rule the first is considered preferable. Nitrate of lime, cyanamide, dried blood, and raw guano appear to be inferior to these. In the earlier crops of the experiments the best results were obtained by a mixture of one third nitrate of soda and two thirds sulphate of ammonia ; but during the latter years this mixture did not prove more efficacions than did either sulphate of ammonia or nitrate of soda alone. When applied in quantities supplying more than 40 to 50 lbs per acre, dissolved guano and sulphate of ammonia are the best sources of nitrogen for the sugar cane on the alluvial soils of British Guiana, the latter being the more economical. The sugar cane makes more effectual use of the nitrogen supplied by 250 lbs. of sulphate of ammonia and by about 300 lbs. of nitrate of soda per acre, than it does of that supplied by heavier dressings. On the whole, dressings of from 2 to 3 cwt. of sulphate of ammonia per acre appear to be the most certainly profitable applications of nitrogen, although in favourable seasons the use of still higher proportions has proved useful.

Mean results of manuring with sulphate of ammonia.

	Series I.	Series II.	Series III.
No. of varieties used	27	11	19
	Tons of canes per acre		
No nitrogen	17.8	13.4	19.1
Low nitrogen (40 lbs. per acre)	23.5	—	—
Normal » (60 » » »)	—	19.8	27.4
High » (80 » » »)	28.1	—	—
» » (90 » » »)	—	23.8	—

Mean results of manuring with dressings not exceeding 300 lbs. of sulphate of ammonia per acre.

Varieties	Tons of cane for each 10 lbs. of nitrogen applied.
Demerara 419	2.00
Sealy	1.87
Demerara 625	1.80
» 74	1.62
» 146	1.62
Barbados 147.	1.52
"White transparent"	1.50
Demerara 118	1.42
» 3956	1.40
» 130	1.23
Demerara 95	1.18
» 4399	1.17
Bourbon	1.15
Demerara 116.	1.12
» 109.	0.90
« 208.	0.82
» 4397	0.78
» 4395	0.86

Mean results of comparative manurial trials with sulphate of ammonia and nitrate of soda.

No nitrogen	100
Nitrate of soda, 1906-1911, after 14 years of sulphate of ammonia	175 ± 9.0
Nitrate after 14 years of nitrate of soda	166 ± 11.0
Sulphate of ammonia, 1905-1911, after 14 years of nitrate of soda.	208 ± 20.8
Sulphate after 14 years of sulphate of ammonia	182 ± 10.0

Mean comparative results for different nitrogenous manures 1910-1911, *in tons of sugar cane per* 10 *lbs of manurial nitrogen.*

Manure	tons of cane
Sulphate of ammonia	1.91 ± 0.23
Nitrate of soda.	9.57 ± 0.29
Nitrate of lime	0.87 ± 0.25
Cyanamide.	0.62 ± 0.21
Dried blood	0.45 ± 0.29

Note. — Humidity excessive.

Effects of phosphatic and potassic manures. — The application of phosphate of lime to the sugar cane gives somewhat increased yields when used with manurings of nitrogen and potash. The increases are higher when the applications are made to plant canes than when added to ratoons. But the values of the increases in yields, except perhaps during the first two or three crops after the land has been placed under cultivation, are not remunerative. Superphosphate of lime appears to be the best form of phosphate to apply to long cultivated cane lands which have their subsoil water alkaline. New lands are preferably treated with basic superphosphate, or with basic slag the former of these in our trials having given somewhat the better results; but basic slag is lower in price and hence more economical to use. Mineral phosphates to give increased yields must be applied to the soil in such heavy dressings that their use is decidedly unprofitable.

The addition of potash when applied either as sulphate of potash or as nitrate, exerted little, if any, effect, the normal weathering of the constituents of the soil setting free for each crop potash in excess of the quantity necessary for the requirements of the plants. This holds good under ordinary conditions of cultivation, where the greater proportion of potash taken up by the plants is directly returned to the soil; but where the canes and cane tops are removed from the land, as in nurseries, it is probable that partial potash exhaustion will take place in the course of a very few crops

Other methods of treatment. The application of molasses gave no decisive results and those obtained with nitro-bacterine were negative.

The use of lime resulted in largely increased yields during the earlier years of the trials, but whether or not its use results in profitable increases depends on the price of sugar. Its action is principally mechanical in improving the texture of the land and it is a question of much importance whether this effect could not be obtained more profitably by the use of light ploughs or cultivators.

Land fallowed from cane cultivation and allowed to become overgrown with indigenous, largely leguminous, herbage for a period of about 3 years, has shown in comparison with similar land under continued cultivation, with short periods of bare fallow, a marked improvement in its tilth, and in its contents of humus and combined nitrogen.

The effects of long continued cultivation and application of manures upon the land. — The soils of heavy clay sugar-cane-lands of British Guiana are, as a rule, slightly to markedly alkaline in reaction, which accounts for the fact that sulphate of ammonia usually gives better results than does nitrate of soda where these manures are applied in heavy dressings, for it enables nitrification to take place very readily in the soil during the existence of favourable meteorological conditions. The alkaline state of the soil replenished by that of the subsoil waters brought up by capillarity during dry seasons enables sulphate of ammonia to be used year after year without injuring the soil by making it sour.

The alkalinity of the soil-waters is increased by cultivation of the land, with its attendent increased plant growth, and by the action of some chemical manures on the soil, so that in the course of long continued cultivation the alkalinity of the capillary water of the soil tends to become excessive, with consequent falling off in the crops. The marked alkalinity and the high content of salts of magnesium and of sodium chloride of the ascending subsoil water act detrimentally on growing crops during dry seasons, and may be the cause of much of the cessation of active growth, of the wilting, and of the scorching of crops soon after the commencement of and during the dry season. Where the soil contains much organic matter undergoing active oxidation, the soil-water remains saturated with carbonic acid gas, which retains the salts of lime in solution, thus modifying beneficially the toxic action of the magnesium salts and the sodium chloride on the plants.

The long-continued use of nitrate of soda in heavy dressings acts detrimentally on the flocculation of the clay in the heavy clay soils and tends to reduce more or less permanently the productivity of the soil. This effect appears to be due to changes in the layers of soil immediately beneath those to which cultural operations usually extend, and may be remedied by deep and thorough forking of the soil.

The growth of sugar cane without the use of nitrogenous manures is accompanied by marked losses of the combined nitrogen, and of the humus constituents of the soil. Where nitrogenous manures were used, the loss of nitrogen was increased, being somewhat less where nitrate of soda was used than where sulphate of ammonia was applied. The combined nitrogen and the humus constituents which accumulate in the upper layer of the soil during long periods of fallowing suffer great and rapid losses when the soil is put under intensive sugar cane cultivation, and to this loss of readily available nitrogen is due the marked falling off in the yield which is almost invariably noticed when successive crops are taken off from either new or long rested soils. The system followed in British Guiana of manuring with sulphate of ammonia, with or without potash and phosphates, with intervening resting or fallowing from cane cultivation during which the land becomes covered with native herbage, largely leguminous, is one accompanied by conservation and possibly increment of the nitrogen of the humus constituents of the soil.

During the first period of the trials there was an apparent loss of nearly 40 per cent of the phosphoric anhydride of the soil, soluble in 1 per cent citric acid. In the second period, during which greatly improved drainage has been in operation and the tillage has been more perfect, the proportion of phosphoric anhydride soluble in 1 per cent citric acid has increased, and where phosphatic manures have been continuously applied, the proportion of available phosphoric anhydride in the soil has been considerably added to. British Guiana sugar cane soils which contain more than 0.007 per cent of phosphoric anhydride soluble in 1 per cent citric acid solution by 5 hours' continuous shaking, will not as a rule respond to manurings with phosphate, whilst it is doubtful if soils yielding from 0.005 to 0.006 per cent of phosphoric anhydride will benefit by phosphatic manurings; but if the soil yields less than 0.005 per cent, it is advisable to apply heavy dressings of basic slag or lighter ones of superphosphate or of basic superphosphate.

Results prior to 1902 suggested that cultural operations set free potash soluble in 1 per cent citric acid solution to an extent greater than the crop demands, but the results of the second period do not confirm this view and the potash soluble in 1 per cent citric acid is now less than it was at the inception of the experiments in 1891. The great demands of the sugar cane for potash are met from the reserves in the soil which are not soluble in 1 per cent citric acid. British Guiana soils which yield 0.006 per cent of potash to 1 per cent citric acid can be regarded as containing, under the usual system of cultivation, sufficient available potash for the needs of the sugar cane; if the soil yields from 0.005 to 0.006, it is doubtful if the application of potash salts will result in remunerative returns, but where the yield falls below 0.005 per cent, it is advisable to add potash salts in the manures.

The demands of sugar cane for lime as plant food is low, and if the soil gives up more than 0.006 per cent to 1 per cent citric acid, it will probably yield sufficient plant food for ordinary crops.

The cultivation of sugar cane is accompanied by loss of available lime from the surface soil, so that even if large dressings are applied, it is practically entirely removed in the course of 20 years.

Finally neither improved methods of cultivation, nor liming the land, nor the use of manures, affects the proportion of sugar contained in the sugar cane.

Long continued cultivation tends to ameliorate the texture of heavy clay land; the judicious use of natural and artificial manures increases this effect, the upper layers of the soil tending to become more friable, but this result is frequently offset by the great reduction of humus matters present in the soil.

940 – **Sugar Beet in the Argentine.** — DE MARNEFFE, G. in *Journal d'Agriculture pratique*, Vol. 1, No. 21, pp. 657-659. Paris, May 22 1913.

As a result of some trials carried out at Juancho in the province of Buenos Aires a yield of nearly 8 tons of beet per acre was obtained, with an average sugar content of 14.3 per cent. The circumstances were unfavourable to the crop, and it is estimated that the yield could easily be raised to over 13 tons per acre, or in other words that sugar beet crops can be produced in the Argentine equal both in yield and quality to those produced in France.

941 – **Action of Flowers of Sulphur on Sugar-Beets.** — URBAN, J. (Experiment Station for the Sugar Industry at Prague) in *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXXVII, Part 3, pp. 441-444. Prague. June 1913.

This paper gives the results of experiments on adding flowers of sulphur at 180 lbs. per acre to rows of sugar-beets. Averages:

	Roots		Juice	
	weight	sugar	polarization	purity
	gr.	%		
Beets with sulphur (3 rows)	444	20,53	22,56	92,5
» without » (»)	435	20,60	22,48	92,3

The experiments will be repeated in a different form.

VARIOUS CROPS

942 – **Remarks on Hop-Growing.** — HITIER, H. in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, Year 112, Vol. 119, No. 5, pp. 685-698. Paris. May 1913.

A review giving an account of the extension of hop cultivation in France, Bohemia, Bavaria, England and Belgium. In the case of these centres of production, information is also given regarding the cultivation, harvesting, drying and quality of the crops. For Belgium, data have also been collected as to the cost per hectare of growing hops, and on other subjects of economic importance.

MARKET GARDENING

943 – **The Horticultural Industry at Ghent.** DELMOTTE, R. in *Revue économique internationale*, Year 10, Vol. II, No 1, pp. 7-28. Brussels, April 15-20, 1913.

The writer first describes the botanic and scientific horticlture of the beginning of the nineteenth century and its representative: The Royal Society of Agriculture and Botany founded in 1808, and then proceeds to give an account of the evolution of this industry.

The collector who cultivated thousands of different species of plants has now given place to the market gardener who grows large quantities of two, or three different kinds of plants. This evolution of horticulture at Ghent, which was complete in 1880, gave rise in that year to a powerful organization, the syndical chamber of Belgian Horticulturists. Although this institution chiefly represents the commercial and practical side of the trade it has shown from the first its firm intention of working harmoniously with the senior association, the Royal Society of Agriculture and Botany. Four years after the creation of the syndical chamber, the two Societies organised, at their joint expense, monthly meetings for the valuation of horticultural products. These periodical meetings have been held uninterruptedly ever since and have become more important every year.

Every five years, they are rendered more attractive by a flower show whose development is shown by the figures on the next page.

The town of Ghent and its suburbs boast of 720 horticultural establishments, including 5000 greenhouses, and employ over 3000 hands.

In 1837 the value of the total export of plants from Belgium only amounted to £60 000 per annum. In 1911, the exports from East Flanders, or rather from the neighbourhood of Ghent, to the United States reached the same figure, while the value of the total exports for the same year amounted to £545 356 of which the district of Ghent was responsible for 54.5 %.

In 1912, the worth of the total exports from the district of Ghent alone exceeded £400 000. The principal countries supplied by Belgium are:

Germany	to a	total value	of	£164144	in 1911
France	»	»	»	» 105307	»
The United States	»	»	»	» 94795	»
England	»	»	»	» 56391	»
The Netherlands	»	»	»	» 33366	»

Without making any absolute statement on the subject, it may be said that the plants apparently most in request in the United States are

Year	Number of exhibits	Area of exhibition buildings sq. poles	Number of competitions	Number of prizes awarded
1839	3 722	40	20	22
1844	5 200	»	31	59
1852	3 680	»	34	67
1857	3 066	»	50	89
1862	3 688	»	65	124
1868	9 000	120	241	438
1873	11 000	»	291	»
1878	11 500	200	»	457
1883	11 660	200	»	»
1888	12 000	220	417	»
1893	13 960	240	660	»
1898	15 000	270	720	»
1903	15 796	280	670	531
1908	18 000	400	760	»
1913	?	1200	841	1710

palms, araucarias, azaleas, begonia tubers, and laurels; while to Russia, and especially Moscow, are sent cut flowers, palms, laurels and rhododendrons. Orchids are exported to Paris, Berlin, London, St. Petersburg, Vienna, Rome, Madrid, Amsterdam, Stockholm, Copenhagen etc; new varieties of orchids and aspidistrias find their way to London; and there is a market in Northern France for fruit trees, forest trees etc.

What are the economic factors which have allowed the modern horticultural industry to become, as it is at the present day, one of the first industries in Ghent? The chief factor is incontestably the climate. The plain of which Ghent occupies the centre being only 31 miles from the sea, and in places below sea-level, enjoys a maritime climate. The dominant west winds are laden with warmth and moisture derived from the Gulf Stream and maintain a relatively uniform temperature. The second factor is the nature of the soil. With the exception of the Escaut and Lys valleys, the environs of Ghent have a sandy permeable soil which allows of azaleas and rhododendrons, the two specialities of Ghent being grown in the open from April to October. These plants are placed in beds 5 feet wide, dug out from 4 ½ to 6 in. and filled in with half-decomposed leaf-mould from the neighbouring oak and beech woods. The subsoil furnishes plenty of non-calcareous water which is an essential in watering azaleas.

The facilities of transport: a network of railways, tramways, high roads and canals also assist in the development of this suburban industry.

The fourth and by no means the least important factor is the cheapness of labour in Flanders. The horticultural labourer, without any special training receives an average daily wage of from *2s.* to *2s.5 d.* Further, horticulture in Ghent and the surrounding districts having been a specialised industry for centuries, it has created a class of experienced workers who thoroughly understand the taking of cuttings and the grafting of azaleas as well as the care of the other local horticultural specialities.

In addition, we should mention that owing to the influence of the Syndical Chamber of Belgian Horticulturists a special division known as the Horticultural Office has been created in the Ministry of Agriculture.

IT-GROWING

944 – **Systems of Pruning Vines, and Distance Apart for Planting.** — VIDAL J. L. in *Revue de Viticulture.* Nos 1013, 1014, 1015 and 1017; pp. 689-693, 713-720, 752-756 and 814-819. Paris, May 15, 22 and 29, and June 12, 1913.

The experiments discussed in this article are concerned with plots of vines at Marsville, belonging to the Cognac Vine-growing Station. The vineyard was planted up in 1901 and 1902. The soil is poor and thin, and contains 50 per cent. of calcium carbonate. It has received no manure since the vines were planted. Twenty-four different stocks, chosen from those best suited to calcareous soils, are each represented by a square of 100 vines. Rupestris du Lot is taken as a control at eight different places, thus forming eight plots of 100 each.

Half of each plot is grafted with Folle Blanche, the other half with Colombard ; the first variety is a weak grower and generally grafts badly, while the second binds much better with most stocks.

Each of the two grafted varieties is pruned and trained in three different ways: 1) in the shape of a vase, with props; 2) on Guyot's system, on wires ; 3) on Royat's system, a simple cordon, also on wires. The vintage is weighed every year according to the stock, the system of pruning and the variety grafted on ; the density of the must is determined in the same way. At pruning, the weight of the canes is also determined for each class.

Systems of pruning. — The most striking point shown by the writer's investigations is that for the climate of the Charente departments, hard cutting with long canes gives the heaviest yields, and at the same time hardly affects the quality of the wine or the vigour of the vine. Thus, in his experiments Royat cordons give much better yields than vases; they are also better than Guyots with Folle Blanche and equal with Colombard, whose lowest buds are liable to bear little fruit. The sugar-content of the grapes is decidedly higher on cordons than on Guyots, with equal crop. This comparison cannot be made with vases, as their crop is so much less ; but looking at the average vintage weights, one finds that, though the figures for the vases are very near those for the Royat pruning, yet the must of the latter si denser than that of the former. Lastly, the growth of the cordons, which began by being the least, eventually gives the highest general average ; it is well above that of the Guyot system with both the varieties ; it is also above the vases with Colombars, and about equal with Folle Blanche, in spite of the yield of grapes being three times as heavy.

Barring special requirements of particular varieties, the conclusion which holds for the Charentes should do also for other regions of similar climate that is moist, with considerable atmospheric humidity, and with evaporation from the leaves not too intense (Centre and East), and where there is no hurry in ripening the grapes ; pruning for long canes ought to do well insuch regions. It appears to be so in Champagne. The same should be true for places in which moisture of the soil can compensate for the more or less dry state of the air (plains and valleys).

The most drought-resistant stocks place the grafts which they bear under the conditions they would have in moist soil on stocks requiring more moisture. It is with these that the best results from long canes may be expected.

The Guyot pruning and the other types which may be classed with it, seem to suffer less from lack of moisture ; but all the same Chanzit and Barba have also had better results with cordons than with Guyots in poor and dry soil in the South, where the air is also dry.

But there is no doubt that the vase is the system which exposes the vines least to drought. Provided a sufficient number of eyes are left, this system can give good yields like the other two.

Lastly, in vineyards producing fine wines, where quality is all-important, hard cutting with long canes is greatly preferable to leaving a lot of wood. The first will give a larger yield of equal quality, or if the yield is the same the quality will be very much higher. The more the vintage can be kept back, the more true does this become.

Closeness of planting. — The deductions to be drawn from the first results at Marsville on this subject are here given.

The distance apart for planting should be determined in practice by consideration of the moisture conditions of both soil and air ; further the space between the rows should as far as possible be made convenient for the implements and teams to be used. The distance between the vines in the rows will be the most variable factor, and will allow a fair concordance between physiological requirements and practice. Close planting, at less than 3ft. 3 in × ft. 3 in., is to be condemned outright, as far as the experiments show at present, at any rate for the soil and climate of the Charentes. The 3 ft. 3 in × 3 ft. 3 in. square, though so far very productive, suffers from drought, and sometimes also from grey-rot : it is apparently not to be recommended. It also appears that distances of 6 ft. 6 in. × 5 ft. are too large ; they do not give a maximum total yield. Between these limits, the experiments here described cannot yet furnish precise indications ; but the local practice of planting about 1800 stocks to the acre seems to be sound.

Name or No. of stock	Weight of grapes per vine. Av. of the three pruning methods	Order according to weight of produce	Weight of prunings per vine Av. of the three methods	Order according to vigour of growth
	lbs.		lbs.	
Rupestris du Lot	2.32	23	1.13	9
34 E. M.	2.51	20	1.24	3
420 B.	2.81	15	0.98	20
41 B.	3.46	4	1.10	10
1202	2.59	18	1.19	5
Aramon × Rupestris Ganzin No. 2	2.78	16	1.31	2
Aramon × Rupestris Ganzin No. 1	4.63	1	1.36	1
3306	3.23	9	1.03	14
3309	3.32	8	0.95	21
Berliandieri Rességnier No 1.	3.04	11	1.20	4
Berlandieri Rességnier No. 2	2.60	17	1.02	16
81-2	2.42	21	0.71	24
161-49	3.10	10	1.08	11
Gamay Goudere	2.85	14	1.19	6
420-A.	3.35	6	0.86	22
301-64	3.38	5	1.14	8
301-37	3.01	12	1.08	13
101-14	2.34	22	0.98	18
17-37	2.56	19	1.02	15
Berlandieri d'Angeac	3.32	7	1.08	12
Berlandieri Lafont No. 9	2.88	13	0.98	19
33 A.	3.60	3	1.17	7
554-5	3.63	2	1.00	17
157-11	1.47	24	0.74	23

Stocks for calcareous soils. — The 24 stocks used for the experiment were chosen from the best known at the time of planting. The general averages of the figures obtained during the seven years of the experiments are given on the preceding page.

Making a classification of the best bearers which are also strong growers, we have, in order of merit: I, Aramon × Rupestris Ganzin No. 1; II, 33 A; III, 41 B; IV 301-64, all among the first five for heavy cropping and also among the first ten for growth of wood. Then: V, Berlandieri d'Angeac, and VI, 161-49, which are 7th and 10th for yield of fruit and 12th and 11th for weight of shoots. Lastly: VII would be Berlandieri-Rességuier No. 1, 11th for fruit but 4th for growth. The first five all have an average yield per vine of more than 3 ¼ lbs., the highest reaching 4 ½ lbs; the 6th and 7th only reach 3 lbs.

Examination of the series of yearly figures for weight of shoots shows that these stocks keep up their growth admirably and keep on bearing; none of them shows any falling off.

Besides these first class ones, there are other good bearers, which are rather lacking in vigour of growth, at any rate in this unmanured soil. Such are: 554-5 and 420 A, which show no tendency to exhaustion; 3306 and 3309, which are subject to chlorosis; 301-37, a heavy bearer, but quite gone off as a result of chlorosis; Berlandieri Lafont No. 9, a fairly good cropper; Berlandieri-Rességuier No. 2, here not as good as No. 1, though generally considered superior to it; 420 B, which seemed at first better than 420 A in this vineyard, but now bears much less, though its growth is about the same; Gamay Couderc, vigorous and fruiting fairly well.

It is interesting to note that 41 B, which is widely grown on calcareous land in the Charentes and elsewhere, has maintained its excellent reputation in these exact experiments; and, indeed, without manure in a not very fertile soil.

Folle Blanche and Colombard. — In these experiments Colombard has turned out better than Folle-Blanche, which is not in agreement with the general opinion.

945 - **The Oberlin Vine Hybrids: their Value and Use.** — ROY-CHEVRIER, J. in *La Vie agricole et rurale*, Year 2, No. 27, pp. 6-10, figs. 1-6. Paris, June 7, 1913.

M. Oberlin, Director of the Vine-growing Institute at Colmar, many years ago obtained some very remarkable direct bearers by crossing the Gamays and Pinots with Riparia. The writer has grown some twenty of these varieties and has also made tests of their wine; so long ago as 1894 he was able to state that some of these Riparia hybrids of which the best bearers are Oberlin 595, 604, 605 and 716, were resistant to phylloxera; this is still the case at present, and they are also highly resistant to fungus diseases; further, their wine is of unusual composition and very rich containing 15 to 17° of alcohol, *with a correspondingly high figure for total acidity.*

Direct bearers, easy to propagate, very resistant to phylloxera and fungus diseases, and thriving under varying conditions (Nos. 604 and 605 can stand a high lime content), have a great value for mixed farms in which field work may interfere with the care of the vineyard. Further, their rapid flowering, never hindered by the bunch mildew, keeps them free from the first generation of *Conchylis*. But their chef merit is their remarkably early ripening, which takes place at the same time as with the Early Vosges Gamay or even before it; further, in spite of the unsettled weather to which the vines in the cold East region are exposed, the Oberlin hybrids always give a highly alcoholic wine, owing to the perfect ripeness of their grapes. Contrary to the general rule that acidity decreases with increase of sugar, in these grapes the two reach a maximum together. Thus No. 595 often passes 17° of possible alcohol with 9 gms. of acid calculated as sulphuric acid; 604 reaches 15° of alcohol and 8 gms. of acid; 605, 16° and 9 gms., and 716, which had more than 15° of alcohol, retains 13.6 gms. of acid.

The value of the Oberlin is therefore in getting a full and alcoholic wine without expense and trouble.

The only fault to be found with these vines is their low yield; the small grapes full of pips, of their rather loose bunches, often give up their juice with difficulty. Further, these very vigorous hybrids, of almost a wild nature, require a tree-like growth on trellises, or at any rate an extension of the cordons, to bring out their inherent fertility. Training as horizontal cordons with double spurs is considered by Oberlin and the writer as the best means of treating them.

Planting should be in deep and rested soil, in quincunx, at 16 ft. in the rows and 4 ft. 6 in. between the rows. Each cordon thus occupies about 8 ½ sq. yds. which means not quite 600 per acre.

The second season only two shoots are left; the third season the better of these is trained onto the wire at 20 ins. from the ground, but to save tying it is simply twisted round it. The fourth season this young cordon is cut with single spurs, and is carried further along the wire. The fifth season the single spurs are changed to double ones, except on the prolongation of the cordon (which should now reach to the next vine), where they are left single. By the sixth or seventh season, according to the strength of the shoots, the cordon is established all the way along, and can be pruned with double spurs from one end to the other. The double spur is easy to deal with: one of the spurs has two eyes and the other four; at the next pruning the four-eyed spur is cut back and the shoots of the two-eyed spur supply the two new spurs, and so on. The spur may always be renewed on the cordon, as the Riparia hybrids keep on breaking from the old wood.

The advantage of the double over the single spur is obvious: the single one, having two eyes, will generally bear four bunches; the double, with six eyes may have as many as twelve bunches giving three times the crop.

On this method, the Oberlin hybrids have given high yields and curiously enough without any impoverishing of the constitutional richness of their wine.

946 - **Fruit Production and Trade in Hungary in 1911.** — Extract from the Report of the Statistical Year Book on the Work of the Government) in *Volkswirtshaftliche Mitteilungen aus Ungarn*, Year VIII, Part V, pp. 517-520. Budapest, May 1913.

The climatic conditions of 1911 having in the main been favourable to the fruit harvest, the results obtained from most kinds of fruit trees were better than in 1910. The data on exportation are satisfactory: The quantities exported tend to increase whilst those imported diminish. The great decrease of importation in 1911 is not accompanied by a corresponding decrease in value, on account of the rise in prices of some kinds of fruit; on the contrary whilst the importation in 1910 represented a value of £ 338 600. That of 1911 amounted to £356 443. On the other hand with the quantity of the fruit exported in 1911 the value also increases and reaches £868 310 whilst all the exports of fruit in 1910 attained only £566 978. The annexed table shows the quantities and values of fruits imported and exported during the period 1909-1911.

The greatest part of the Hungarian fruit trade is with Austria; thus of 507 400 cwt imported in 1911, 193 700 (38.2 per cent of the total import) came from Austria and of the 1 500 578 cwt. exported, 1 024 040 cwt. went to Austria. After Austria comes Serbia; that country exported into Hungary 169 670 cwt. of fruit (33.4 per cent. of the total imports). 65 601 cwt. (12.9 per cent.) were imported from Bosnia, 48 720 cwt (9.5 per cent.) from Italy, whilst only 11751 cwt. (2.3 per cent.) came from Rumania, 6522 cwt (1.3 per cent.) from Turkey in Asia and 5119 cwt (1. per cent.) from Turkey in Europe.

Of the fruit imported from Austria 71.9 per cent. consisted of apples and pears, 7.9 per cent. of juniper berries, 4.2 per cent. cherries and egriots. Among the fruit imported from Bosnia 46.6 per cent. were dried plums, 24.1 per cent. fresh plums, 10.8 per cent. walnuts. In the imports from Serbia, 69.3 per cent. were apples and pears, 17.3 per cent. fresh plums and 8.6 per cent. dried plums. From Italy the chief fruit imports were apples, pears, and juniper berries; from Rumenia walnuts and prunes; from Turkey in Europe walnuts and from Turkey in Asia walnuts and hazelnuts.

Among the purchasers of fruit exported from Hungary, Germany comes after Austria. In 1911 Hungary sent to Germany 425 287 cwt. (28.3 per cent.) and to the United States which come next only 8273 cwt. Of the fruit exported to Austria the percentage was the following: 23.7 apples, 21.1 fresh grapes, 12.4 cherries and egriots, 6. apricots. To Germany the exportation was chiefly apples (84.3 per cent.) and fresh plums (7.2 per cent.) whilst to North America it was especially walunts.

Imports

	Weight			Value		
	1909	1910	1911	1909	1910	1911
	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces	636 144	351 693	209 203	222 561	134 575	127 676
Fresh plums. . . .	146 194	98 524	51 158	21 610	21 927	16 257
Apricots	1 480	638	348	1 031	912	476
Cherries, Egriots, Fresh Peaches .	29 197	15 815	15 526	20 341	13 799	12 094
Fresh Melons . . .	7 671	4 843	3 414	3 489	2 260	1 190
Other Fresh Fruits.	5 072	4 572	6 370	2 577	2 260	3 569
Juniper berries. . .	12 074	15 712	31 252	6 423	6 780	19 467
Dried plums	122 256	41 281	49 397	49 445	44 132	64 155
Other dried fruits .	6 402	3 962	2 393	4 362	2 379	2 657
Fresh grapes. . . .	12 290	8 657	8 718	6 820	7 216	9 159
Walnuts.	49 611	40 472	29 298	36 796	41 594	31 840
Hazelnuts	12 286	19 139	19 322	32 915	60 944	68 001
Total . . .	1 040 678	605 308	507 400	412 370	338 778	356 543

Exports.

	cwt	cwt	cwt	£	£	£
Apples, Pears, Quinces	151 064	106 912	638 638	70 103	52 696	204 678
Fresh Plums. . . .	90 699	292 093	217 667	29 183	96 629	98 374
Apricots.	172 377	34 604	71 867	93 259	44 568	90 761
Cherries, Egriots, fresh Peaches . .	105 701	47 974	140 488	61 499	33 180	77 438
Fresh Melons . . .	79 466	68 508	79 987	21 491	18 200	24 504
Other fresh fruits .	38 580	47 488	47 265	19 389	30 254	31 166
Juniper berries. . .	19 131	15 474	4 757	10 190	6 741	2 974
Dried plums	18 030	12 991	13 304	11 816	14 592	17 803
Other dried fruit. .	5 550	9 820	9 895	3 925	6 582	8 327
Raisins.	201 643	155 590	221 451	139 809	147 462	201 387
Walunts.	23 573	57 403	54 504	23 949	114 710	108 327
Hazelnuts	256	1 098	755,71	317	1 507	1 031
Total . . .	901 071	850 754	1 500 578	484 930	567 129	866 770

947 – **Bananas, Their Cultivation and Utilization. Trade in Banana Products. Classification of the Genus *Musa*.** — WILDEMAN, E. de in *Annales du Musée Colonial de Marseille* 1912. Extract, Editor Challemel, Paris 1913.

Bananas are not yet sufficiently, well understood both from the scientific and from the economic points of view. Great confusion prevails as regards the systemization of the genus *Musa*, although few plants are capable of yielding as much valuable produce on a small space and with little attention, as the banana. Dr Zagorodsky (1) mentions the following amongst the products of the fruit bearing banana.

1) Fresh fruit for export; (2) Dried fruits; (3) and (4) Preserved and crystallized bananas ; 5) Banana starch and flour ; 6) Sagù, 7) a substitute for coffee ; 8) a substitute for rubber ; 9) liqueurs, alcohol, wine, beer, vinegar etc ; 10) a cattle feed. To complete this list it should be added that all bananas, furnish a fibre extracted from their leaf-sheaths and leaves, but this has not yet been studied systematically.

It appears to the writer that the time has now come to turn to better account this fruit which is so easily grown in the Tropics and always consumed in increasing quantities in Europe. A rapid survey of the statistics of banana export and consumption suffices to prove the truth of this statement. The importation of bananas into Germany increased tenfold between 1906 and 1910. Seven or eight years ago, France and England consumed respectively between 50 and 60 thousand and 2 million bunches of bananas. Now, on the other hand, from 150 to 200 thousand are sent to Paris, while millions are consumed in England. The United States of America alone take 40 millions of bunches worth £ 2 500 000 and America exports the fruit to Europe to the value of ;

£ 1 600 000	Great Britain
» 200 000	Germany
» 100 000	France

Jamaica, Barbados, Domingo and Costa Rica have immense plantations in full bearing. In 1909, Jamaica exported 16 712 210 bunches of bananas, and the area occupied by plantations in 1909-1910 was 69 000 acres. Costa Rica has become a great centre of production and 100 000 acres capable of producing from 700 000 to 12 000 000 bunches monthly have been devoted to this crop.

The writer, after having given some information respecting the application of cold storage methods to banana transport, and the most important question of manuring the soil (2), deals with the diseases and noxious insects which attack the banana tree and with the industry of banana drying. He then enquires which is the best variety for propagation and how it is to be recognized. These queries are difficult to answer for the lack of two things : 1) a satisfactory classification of the genus Musa and 2) a reliable basis of information which would throw some light upon the economics of banana culture. In the hopes of collecting some information which will lead to a rational solution of the problems the writer proposes to draw up a circular letter embracing the following list of questions.

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(1) Dr. M. Zagorodsky. Die Banane und ihre Verwertung als Futtermittel. Supplement to the *Tropenpflanzer*, XII, 4, 1911.

(2) See No. 1278, *B* September 1912.

Enquiry concerning Bananas.

Locality. — Climatic and geographical conditions, and the geological origin of the soil suitable to the plant.

Habit of the plant :

Presence and absence of a species of bulb.
Height, thickness and colour of the stem.
Colour of the cellular sap of the sheaths which form the stem.
Length, width and terminal form of the leaves. Colour of the leaves on upper and lower surfaces.
Colour of the mid-ribs.
Colour of the cellular sap of the leaves.
Resistance to wind, persistence of the leaves or total disappearance in winter.

Form of inflorescence:

Inflorescence bracts, their size and colour. Number of « hands » per inflorescence.
Number of flowers, or fruits, per « hand ».
Is the number constant for the whole inflorescence?. It would be useful to add to the data of this enquiry samples of flowers and of fruit; the flowers should be dried or preserved in alcohol, or formalin; the fruits preserved in formalin. In the case of fruits containing seeds, it would be interesting to include samples for purposes of study.

It would be well to send with the above samples, drawings and photographs referring to all the questions of the enquiry.

To those persons who are able to carry the enquiry further, it is suggested that they should furnish additional information with regard to the botanical characters, *i. e* :

Flowers :

Their colour and length. Perianth : number of lobes and their shape ; stamens : number ; anthers: colour and length ; styles : length, colour.

Fruit:

Shape, colour and size when ripe. Seeded or seedless.
Colour and flavour of the pulp.

Seeds :

Colour, shape, size, state of the epidermis, germination.

Uses:

Unripe, ripe, and preserved fruits, fibre, pith, or central portion, use of rachis.

Various :

Native names ; cultivation and diseases : industrial and economic use of the different parts ; trade and statistics.

948 – Export of Shoots of Date-Bearing Palms. — TRABUT L. in *Bulletin Agricole de l'Algérie et de la Tunisie,* Year 19. No. 9 pp. 185-187. Algiers. May 1, 1913.

The introduction of date culture into the desert regions of the Western United States of America has given rise to a large importation of shoots, or «djebars», from the oases of north Africa. For some years, Algeria has exported annually from 8 to 10 thousand «djebars», and the Algerian planters have become apprehensive of future competition, and alarmed at the rise in price of the necessary shoots for their own plantations.

The writer draws attention to the fact that competition is inevitable and that the rise in price of which the colonists complain is not excessive. Further since it is to be foreseen that for a considerable time it will be possible to supply «djebars» of the Deglet Nur variety at about 4s. each, it would be better to cultivate this variety specially for the production of shoots. To this end he advises that the latter should be carefully selected, planted in nurseries and frequently watered; and after three years there should be six or eight shoots round each parent plant; 800 cuttings or even more under suitable conditions may be planted per acre and would prove more remunerative than the production of dates.

The writer mentions other good varieties for export: 1. The Tafilalet date, called «Medjoul», which the Department of Agriculture at Washington buys at the rate of £2 per guaranteed «djebar». The fruits are large and little known on the French markets, being sent to Tangiers and to London. In Tangiers, the average price is 200 francs per 100 kilos. (£4 0s *7d* per cwt.) 2. The Manakor variety from Djerid also called the Bey's date. The fruit is excellent, and the variety should be propagated at present, it is still rare and as the old palms do not yield shoots, it is therefore necessary to obtain seeds. This is being done, and the variety proves to be fairly constant from seed especially in the Djerid oasis, where good strains are to be found.

The progress due to the work of the American Experiment Stations will certainly have a good influence also upon the North coast of Africa, where the cultivation of the date palm has been considered as fixed by the practice of centuries.

FORESTRY

949 – Management of the State Forests in Bavaria. — ENDRES, in *Forstwissenschaftliches Centralblatt,* Year XXXV, No. 6, pp. 289-296. Berlin, June 1913.

Owing to legislative measures and to the work of the Bavarian Forest Administration, it is possible to give an account of the total production of the Bavarian State Forests of the 4-year period 1908-1911, compared with the 5-year period 1903-1907, but details of the principal and bye-products cannot be given as official statistics in these matters are no longer collected.

Total Production.

	1903-1907 (mean)	1908	1909	1910	1911
Total forest area . ac.	2 060 699	2 018 136	2 019 499	2 016 832	2 019 687
Total volume . cu. ft.	132 968 060	144 694 000	168 780 000	167 367 000	172 821 000
» » (relative)	100	109	127	126	130
Volume per acre cu. ft.	64.5	71.6	83.5	83.0	85.6
Surplus compared with 1903-1907:					
total . . . cu. ft.	—	11 726 000	35 812 000	34 399 000	39 853 000
per ac. . » »	—	5.8	17.7	17.0	19.7
Timber more than 2.7 in. in diam:					
total . . . cu. ft.	115 133 000	125 129 000	147 695 000	144 636 000	152 816 000
» (relative) . .	100	109	128	127	133
per ac. . . cu. ft.	55.9	62.0	73.1	71.7	75.6
Surplus:					
total . . . cu. ft.	—	9 921 000	32 562 000	31 502 000	35 554 000
per acre . . » »	—	4.9	16.1	15.2	17.6
Total receipts . . . £	2 024 856	2 428 899	2 776 527	2 837 289	3 024 663
Mean « per cu. ft. in pence.	3.65 *d*	4.0 *d*	3.9 *d*	4.0 *d*	4.1 *d*
Do. (relative)	100	110	108	111	115

From the data given the following facts become evident:

I. That the production of timber is greater owing partly to an increased cutting of coniferous trees and partly to better management.

II. That prices of timber have risen (8 per cent from 1903-1907 to 1911).

III. That there is a slight gradual fall in prices for firewood during the last few years, this will only rise again with the decreasing purchasing power of money as the relation between the increase of population and the demand for firewood is undoubtedly declining.

Timber.

	1903-1907 Mean	1908	1909	1910	1911
Total . . . . cu.ft.	59 403 000	68 586 000	82 808 000	84 019 000	92 636 000
(relative)	100	115	139	141	156
Per acre. . . . . cu.ft.	28.8	34.0	41.0	41.6	45.6
Per cent of total production	44.7	47.4	47.0	50.1	53.6
» the timber more than 2.7 in. in diam. .	51.6	54.7	56.1	57.3	60.6
Surplus:					
total . . . . cu.ft.	—	9 182 000	23 415 000	24 510 000	33 235 000
per acre . . . . »	—	4.5	11.6	12.1	16.4
Coniferous wood:					
total . . . . cu.ft.	52 446 000	60 992 000	74 385 000	76 673 000	84 337 000
» (relative)	100	117	142	146	161
% of timber	88.4	89.0	89.7	91.3	91.1
Broad leaved wood:					
total . . . . cu.ft.	6 922 000	7 593 000	8 441 000	7 275 000	8 335 000
» (relative)	100	109	122	105	120
% of timber.	11.6	11.0	10.3	8.7	8.9
Oak. . . . . cu.ft.	3 164 000	3 224 000	3 681 000	3 111 000	3 426 000
Total receipts for timber £	1 508 833	1 715 883	1 974 073	2 084 828	3 369 816
Mean receipts per cu.ft. . . . . pence	5.7	6.0	5.7	6.0	6.1
Do. (relative)	100	105	100	105	108

Firewood.

	1903-1907 Mean	1908	1909	1910	1911
Total . . . . cu.ft.	73 565 000	76 108 000	85 962 000	83 419 000	80 205 000
(relative)	100	103	117	113	109
Per acre . . . . cu.ft.	35.7	37.7	42.5	41.3	39.7
Surplus . . . . »	—	2 543 000	12 043 000	9 853 000	16 640 000
Total receipts. . . . . . . £	615 893	715 015	802 453	752 460	709 285
Mean » per cu. ft. . pence	2.0	2.2	2.2	2.1	2.1
Do. (relative)	100	113	112	108	106

950 - **Prize Competition for the Encouragement of Afforestation in Hungary.** — Official communication in *Erdészeti Lapok*, Year III, Part XI, pp. 502-504. Budapest, June 1913.

Paragraph 165 of the forest law XXXI of 1879 deals with the afforesting of arid land, land worn into gullies, and shifting sand; this work is of great economic importance, and to encourage such planting in 1913 the Minister of Agriculture has organized a prize competition, the prizes being supplied from the national forest fund. They will be as follows:

Eleven "grands prix" of £40, £32 and £24 for areas of at least 25 arpents (35 acres).

Ten first-class awards of £20 and £16 for areas of at least 10 arpents (14 acres).

Nine second-class awards of £12 and £8 for areas of at least 5 arpents (7 acres).

The following will be eligible for these prizes: 1) landowners who have undertaken afforestation of the above-named types of land, in the spring or the autumn of 1913, without State subventions; 2) those who, with State assistance, have undertaken this work under conditions of exceptional difficulty, and with unusual care and success, thus benefiting the public more than themselves.

Competitors must undertake the whole of the afforestation work as laid down in paragraphs 2 and 4 of the forest law cited. The plantations admitted to the competition will be judged in 1918. The competitor will not be eligible for a prize unless the plantation is still in his possession at the time when the prizes are awarded.

Inscription of planting carried out in the spring will be received up to the end of July, that of autumn planting to the 25th of December; it should be addressed to the Public Forest Administration Committee or to the Royal Forest Inspectorate. Such inscription should include a detailed description of the place and give the area afforested and an exact enumeration of the species of trees used.

LIVE STOCK AND BREEDING.

HYGIENE

951 - **The Campaign against Flies.** — Bauwerker in *Zeitschrift für Gestütkunde und Pferdezucht*, Vol. VIII, Part 6, pp. 121-129. Hanover, June 1913.

Flies are often a real pest to man and domestic animals, especially when they invade stables. The importance of the destruction of flies has even been the subject of a discussion by the Budget Commission of the Prussian Chamber of Deputies, in connection with the removal of the Thoroughbred stud from Graditz to Straussfurt, the latter place being infested with flies.

The reasons for destroying these persistent and dangerous insects are well known, and many methods of destruction have been devised; but the writer considers that appreciable and durable results can only be obtained by giving up half measures and undertaking an energetic and systematic campaign. Considering the importance of the question, he has thought well to give an account of the methods he has used in the stud under his direction at Eichelscheiderhof, as the results have been very satisfactory. In 1887 when he undertook the direction, the stud was so badly infested by flies that living there was most disagreeable in summer.

He began by hanging up in the stables and all dwellings, without exception, pieces of limed wood, bigger and longer for the stables, thinner and shorter for the houses. For some time the flies had to be removed and the sticks re-limed every day; but when the flies were somewhat reduced this was done only every two or three days. In the earlier years the cost of the lime was considerable (£ 4 to £ 4 10*s*), but it soon diminished considerably.

Various other means were employed. Further, the general conditions were much improved by the drainage of the land round the stud farm, which was rather marshy and provided excellent conditions for flies to breed. Great benefit was also derived from scrupulous cleanliness throughout the homestead, including disinfection of closets and cess-pools, and ventilation of the stables. Flies dislike draughts, whereas the animals, being accustomed to open air when quite young, do not take any ill effects from them.

The flies were also destroyed in places where they like to assemble; a great number were burnt by spirit lamps, being collected at the approach of winter on the celling and walls of the kitchens; in this way many eggs were destroyed before they had time to develop. It was found that white-ofashing with a sprayer was an excellent means of destroying the eggs; this was still better when a little formalin was added to the milk of lime. For disinfection, a strength of 2 or 3 per cent. was used; but 1 per cent. does for ordinary purposes.

Formalin is an excellent fly-poison. The writer had good results with a method he got from a paper: this consists in setting out on a plate small slices of bread soaked in a pint of milk to which two spoonfuls of formalin have been added. A pint was found to be enough for large spaces, such as stables; while for smaller places, such as dwelling-rooms, half a pint is sufficient.

Having undertaken a systematic fight, the writer did not neglect any of the usual methods, such as fly papers and fly traps; but he did not find them very successful.

Attempts were made also to encourage as much as possible the natural enemies of flies, especially insectivorous birds. Swallows and martins were the first to be pronounced useful; as it was found that sparrows were preventing their increase in numbers by occupying their nests during their absence, a campaign against these was undertaken, and quantities were destroyed. The number of swallows and martins steadily increased, and they now nest all about the buildings.

The increase of starlings was encouraged by putting up Berlepsch nesting-boxes for them. Other insectivorous birds were encouraged in every possible way (planting of pines and fruit-trees, destruction of their enemies: martens, polecats, weasels, squirrels, birds of prey, etc.).

Quantities of flies were also destroyed by the large numbers of fowls kept at Eichelscheiderhof.

Thanks to all these measures, the stud-farm has now been very largely freed from the pest.

At the end of the article the writer alludes briefly to methods of protecting draught animals from flies and gadflies — close metal nets, and treating the skin with repulsive substances, such as fish-oil.

952 - **Resistance of Various Animals to Arsenic.** — WILBERG, M., with appendix by SCHIROKOGOROFF on pathologico-histological researches (Report of the Pharmacological Institute of the University of Jurjeff), in *Biochemische Zeitschrift*, Vol. 51, Part 4, pp. 131-252. Berlin, June 1913.

The subject of the resistance of animals to arsenic is of importance at present in view of the recent progress on the pharmacology of arsenic, particularly as regards the preparation and use of atoxyl and salvarsan. M. Wilberg's researches were directed to establishing the doses tolerated and the minimal fatal doses for various animals. After discussing the literature of the subject, he describes experiments on dogs, cats, rabbits, hares, rats, hedgehogs, guinea-pigs, fowls, pigeons, and adders; the doses tolerated are given in the following table.

Animal	Means of ingestion of the compound	Dose in gr. per kg. of body-weight	
		Potassium arsenite	Arsenious oxide
Pigeons	buccal	—	1.786
	sub-cutaneous	less than 0.012	—
Rats	sub-cutaneous	0.0156–0.0176	—
Hedgehogs	sub-cutaneous	0.01–0.014	—
Rabbits	buccal	—	0.015
	sub-cutaneous	0.008–0.01	—
Dogs	buccal	0.03	0.03
	sub-cutaneous	0.007	—
	intravenous		
Guinea-pigs	sub-cutaneous	0.009	—
Cats	sub-cutaneous	0.005–0.006	—
Hares	sub-cutaneous	more than 0.005 and less than 0.008	—
Fowls	buccal	—	less than 0.06
Adders	sub-cutaneous	0.012	—

From these results it is clear that different animals do not show the same degree of resistance to the action of arsenic. Rats are the most resistant; then come hedgehogs, guinea-pigs, dogs, cats. Arsenic resistance has some relation to size: the smaller the animals, the greater it is. Man is the most sensitive of all animals, probably owing to the great development of his nervous system.

The subcutaneous tissue of dogs is very sensitive to injections of potassium arsenite, and becomes necrosed at the place of injection, as does the cutaneous tissue. Hares are much less resistant than rabbits to subcutaneous injections. With pigeous and dogs, vomiting readily takes place, so that strong doses of arsenic introduced through the mouth are almost without action.

For the minimal fatal doses, the writer has collected in a table the results of a great many investigators (Busscher, Brouardel, Rouyer, Salkowsky, Neucki and Sieber, Kochmann, Kunkel, Doyen and Morel, Fröhner, Hausmann). His experiments were made with hedgehogs, and gave doses of 0.011 to 0.015 of potassium arsenite by sub-cutaneous injection.

The article is followed by an appendix containing the results of pathologico-histological researches made under the microscope on various organs of dogs, cats and rabbits treated with arsenic.

953 – **Fate of Tubercle Bacilli outside the Animal Body.** BRISCOE, CHAS. F. in *University of Illinois Experiment Station, Bulletin* No. 161, pp. 277-375. Urbana, Illinois, November 1913.

The results of this experimental work are given in tabular form. The paper is accompanied by a bibliography referring to 160 publications.

It is seen from the above-mentioned table that tubercle bacilli in pure culture, spread in thin layers on sterile glazed paper slips and exposed to the direct rays of the sun, are killed in a very short time (1 to 4 minutes). When exposed to desiccation, pure cultures of these germs in thin layers are found to be dead in a few days. In sputum, and other foul material, they appear to live longer than the other nonspore-bearers, and are blown around so that the inhalation of dried sputum dust causes tuberculosis in test animals. Sunlight plays an important part in the disinfection of this dried tuberculous dust; thus dwellings, factories and places of business should have abundance of window space located so as to admit the light.

Tubercle bacilli in cow manure lived 73 days, when a pure culture mixed in a sample of manure was exposed to weather conditions in a pasture field in the shade, and as long as 49 days, when exposed to the sunshine. In a sample of dung from a tuberculous cow, they were dead at the first test, made 13 days after exposure. These experiments, which the writers were disappointed to be unable to repeat, are worth repetition.

Tubercle bacilli in garden soil and in a dead tuberculous guinea-pig buried in the latter were alive on the 213th and 71st days respectively.

In drinking water, which may be a source of infection, the bacilli of human tuberculosis and of bovine tubercolosis live for a year.

In butter kept at — 10° C., the tubercle bacilli retain their virulence longer than when the butter is kept at high temperatures (in the experiments they survived 274 days), and constitute a serious danger.

954 - Modifications in the Milk of Cows suffering from Foot-and-Mouth Disease.

MEZGER, O., JESSER, H, and HEPP, K. (Report from the Municipal Chemical Laboratory of Stuttgart) in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel, sowie der Gebrauchsgegenstände*, Vol. 25, Part 9, pp. 513-551. Berlin, May 1913.

After a careful examination of the bibliography of the subject, the writers describe the methods adopted and the conditions under which they made their investigations. The results are shown on 26 tables, each dealing with one cow; complete analyses are given of the milk at various stages of the disease, with notes on the most striking phenomena in each case.

The conclusions arrived at are then compared with those of other investigators. It appears that the influence of the disease on the composition of the milk is not the same for animals of any one breed, nor for those in the same lactation period; it seems to vary in individual cases.

ANATOMY AND PHYSIOLOGY

955 - The Alcohol Content of Milk after giving Cows Various Doses of Alcohol and under the Influence of Habit.

— VÖLTZ, WILHELM and PAECHTNER, JOHANNES in *Biochemische Zeitschrift*, Vol. 52, Parts 1 and 2, pp. 73-95. Berlin, June 25, 1913.

The question, whether alcohol given with the food passes into the milk, and if so in what proportions, has often been studied but has not yet been satisfactorily answered; for this reason the writers have instituted some experiments on the subject.

The animals they experimented upon were two North German cows of the plains (Norddeutsche; Niederungskühe) weighing about 1100 lbs. each, of the age of 4 to 5 years and in the middle of their lactation. The experiments lasted from March 27 to April 29 of this year.

Cow No. 1 was fed good meadow hay, oat straw, malt germs, potato flakes, and dried yeast. During the experiment with alcohol she received with the alcohol 46.2 lbs. (sometimes 92.4 lbs.) of potato distiller's wash containing 1.98 lbs. dry matter and 44.22 lbs. water (or 3.96 lbs. dry matter and 88.44 lbs. water). The cow received the 44.22 lbs. of wash with the alcohol in one dose at noon, immediately after having been milked, or double the quantity in two equal doses, one at noon and the other in the evening.

It was not considered necessary to determine exactly the quantity of food consumed by this cow.

Cow No. 2 was given, the first day of the experiment (April 22), as well as during the preceding 13 days, 20.57 lbs. of dry matter under the form of dried beer yeast. From that date up to April 25 when the experiment ceased, the cow was fed only hay.

The alcohol, mixed with water, was given at the rate of 3.52 to 5.27 quarts of beverage, sometimes in one dose sometimes in two.

In order to determine in what quantity alcohol passed into the milk, the cows were milked three times a day; the milk, which was always faultless, was weighed and immediately portions of it — weighing 100 to 200 grams and sometimes as much as 500 to 1000 grams — were distilled.

The annexed table gives the quantities of alcohol found in the milk and those given to the cows.

Experiment	Cow	Quantity of absolute alcohol given c. c.	Quantity of absolute alcohol found in the milk		
			Daily c. c.	Per thousand	In percentage of the quantity given
1	I	200	0.49	0.09	0.24
2		400	2.58	0.42	0.65
3		400	1.15	0.18	0.29
4		400 (1)	1.09	0.17	0.27
5		400	1.58	0.25	0.40
6		400	1.13	0.17	0.28
7		400 (1)	0.18	0.03	0.04
8		800 (2)	0,41	0.05	0.05
9		400	0.72	0.11	0.18
10		63	0.00	0.00	0.00
11		126 (3)	0.00	0.00	0.00
13		400	0.71	0.11	0.18
15		800 (2)	0.48	0.07	0.06
16		400	0.40	0.06	0.10
12	II	63	0.12	0.02	0.19
14		126 (3)	0.13	0.02	0.10

1) In 2 doses, each of 200 c.c.
2) » 2 » » » 400 »
3) » 2 » » » 63 »

The above figures show that only a small quantity of the alcohol given passes into the milk, and that the animals at last got accustomed to the alcohol and that always smaller quantities of it passed into the milk. Even with quantities reaching 400 c.c. in one dose and 800 c.c. in two doses, corresponding respectively to 0.8 and 1.6 per thousand of the weight of the animal, only from 0.05 to 0.4 per cent. of the amount given passed into the milk. As the distiller's wash usually given by farmes does not contain more than 0.1 to 0.3 per cent. of alcohol, it may be assumed on the strength of these experiments that feeding distiller's wash presents no danger to the life and development of the sucking calves.

The writers have further experimented npom human milk and have found that after a moderate use of alcohol only small and harmless quantities of it pass into the milk.

956 - **Experiments on Carnivora on the Economy of the Nitrogen of Food caused by Certain Salts, especially by Sodium Acetate.** - PESCHECK, ERNST in *Biochemische Zeitschrift*, Vol. 52, Parts 3 and 4, pp. 275-330. Berlin, June 30, 1913.

The writer begins by summarizing the results of his previous studies on the subject, as well as the researches of Voltz, Grafe, Abderhalden and others on the action of several salts on the retention of nitrogen in the animal body. He also communicates the results of his recent investigations on the action of ammonium and sodium salts on the metabolism in dogs. The writer finds, as Abderhalden had found, that sodium acetate added to a certain ration reduces the exchange of nitrogen and especially the excretion of nitrogen in the urine. The same effects were produced by sodium citrate, sodium lactate, magnesium acetate, and ammonium salts. Sodium acetate often had a more energetic action in saving nitrogen than ammonium acetate, for which reason the writer cannot agree with several investigators who consider that ammonium salts and nitrogen free foods form complicated chemical compounds in the bodies of animals which can be utilised in building up its proteins.

According to the experiments of the writer it appears that it is the metal and not the acid radical which causes the action of the salts in hindering the elimination of nitrogen. In a future number the writer proposes to publish the results of experiments which he has conducted on herbivorous animals.

FEEDS AND FEEDING

957 - **Acorns and Beechnuts as Food for Stock** (1). — ENGELS, O. (Report from the Speyer Agricultural Experiment Station) in *Die landwirtschaftlichen Versuchs-Stationen*, Vol. LXXXII, Part 1-2, pp. 93-148. Berlin, June 1913.

The writer divides his article into two parts, dealing respectively with acorns and beechnuts.

I. Some general information is given on the distribution of the chief species of oak.

Coming to acorns, the writer gives the results of analyses made by certain investigators, as well as his own, made on samples from various parts of the Palatinate. The determinations were made according to the methods approved by the "Verband landwirtschaftlicher Versuchs-Stationen im deutschen Reich" (Union of German Agricultural Experiment Stations). Crude fibre was determined according to J. König's method.

Analyses of six samples of air-dried acorns gave the following results:

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(1) For the use of acorns for feeding stock, see No. 3190, *B.* Nov.-Dec. 1911; No. 689, *B.* April 1912. (*Ed.*).

	per cent.
Kernels:	
Moisture	36.02 — 46.63
Crude protein	3.49 — 4.11
Ether extract (fat)	1.68 — 2.57
N-free extract	44.58 — 53.21
Crude fibre	2.00 — 2.94
Ash	1.54 — 1.84
Hulls:	
Moisture	25.75 — 36.25
Crude protein	1.94 — 2.73
Ether extract (fat)	0.49 — 1.76
N-free extract	29.98 — 39.94
Crude fibre	26.84 — 33.49
Ash	1.50 — 1.79
Whole acorns:	
Moisture	34.57 — 44.82
Crude protein	2.27 — 3.91
Ether extract (fat)	1.62 — 2.42
N-free extract	43.09 — 50.86
Crude fibre	5.73 — 7.26
Ash	1.53 — 1.78

Further investigations were made on the components of acorns. They form a food poor in protein, but yet of considerable nutritive value owing to their high content of carbohydrates, and also very digestible. The characteristic components are tannic acid and a bitter principle, quercine. These two bodies may give rise to digestive troubles, particularly constipation, if acorns are fed in large quantities. If the acorns are spoiled or musty, they may be dangerous; they should therefore be kept as carefully as possible. Freshness is the best guarantee of their feeding value.

Next to game, pigs make the best use of acorns; sheep and goats also take them occasionally. In Southern Hungary and Slavonia (1) the pigs are driven into the oak woods, where they pick up the acorns and can thus be fattened for slaughter, as they also eat various plants, fungi, etc., which supply them with the mineral matter (phosphoric acid and lime) which is rather lacking in acorns. If the pigs are fed in sties, they should be given small quantities, especially to begin with, not more than 2 to 3 lbs. per head per day; the ration should be made up by green food, nitrogenous food and plenty of water. Under these conditions, acorn feeding produces excellent bacon, but without care the results may be anything but good. Acorns are best fed to pigs crushed and mixed with the other food. When given with laxative food they have a strong binding effect. It is a good thing to spread some in paddocks where pigs are running.

Goats and sheep may be given small quantities of acorns; fattening bullocks may get up to 6 lbs. per 1000 lbs. live-weight, but they must be fed with plenty of green stuff, such as beet leaves and slices, as well as roots and concentrated nitrogenous food (bran, etc.). For dairy cows and horses, the bitter principle must be removed, or they should be cooked; and they must always be fed in moderation and gradually.

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(1) Also in Italy, Spain, Portugal, etc. (*Ed.*).

It is always safer to use dried and hulled acorns, as the hulls (which make about 15 per cent. of the total weight), have a very low nutritive value and contain the bulk of the injurious substances.

Dried and hulled acorns, even at about 7*s* 6*d* a cwt., may be considered a useful and fairly cheap food. There is no doubt that thousands of pounds' worth are lost to German agricultural economy in the woods each year.

II. Beechnuts may well be used for feeding pigs and sheep, though so far such use is limited. The writer gives information on the distribution of beech, especially in Germany; he discusses the conditions of temperature, moisture and soil necessary for it, and describes its botanical characters. He then goes on to the chemical composition of the nuts, giving the analyses made by several investigators (Boussingault, Schädler, König), and his own results from the analysis of samples from the Forest Office of Kandel-Süd. These figures are as follows:

		%
Kernels:		
	Moisture	14.04
	Crude protein	24.52
	Ether extract (fat)	36.31
	N-free extract	11.24
	Crude fibre	9.59
	Ash	4.30
Hulls:		
	Moisture	20.51
	Crude protein	3.36
	Ether extract (fat)	0.91
	N-free extract	32.74
	Crude fibre	37.49
	Ash	2.64
Whole nuts:		
	Moisture	16.25
	Crude protein	17.25
	Ether extract (fat)	24.16
	N-free extract	19.47
	Crude fibre	19.15
	Ash	3.72

Besides the general chemical analysis, more detailed investigation of the composition was made.

The nutritive content of beechnuts is high, and their digestibility is excellent, especially when they are hulled. Feeding trials have shown that a certain quantity of beechnuts can well be fed to stock. The writer recommends that they should not be given to horses, as they may be harmful. A report by Pusch in the *Berliner Tierärztliche Wochenschrift* mentions that horses are specially susceptible to the action of a poisonous compound, fagine, occurring in beechnuts. Experiments in France have, however, shown that horses may be given up to 6 ½ lbs. daily of beechnuts without ill effects. No bad effects are shown by cattle, sheep, pigs, rabbits or poultry on moderate rations of beechnuts.

The chief use of beechnuts is for fattening pigs in the woods; here also, it should be remembered that heavy feeding on these nuts requires plenty of drinking water.

The writer recommends that beechnuts should be hulled; this can easily be done in ordinary mills. Keeping the nuts requires special care; the best method is to spread them out on a floor in a thin layer and turn them every day so that they keep on sweating; otherwise they very easily go mouldy and various poisonous decomposition products form in them. If they spoil in spite of these precautions, they must be cooked before feeding.

To collect the fallen beechnuts, the simplest way is to sweep them up into heaps and clean them by winnowing. The drying may be hastened by putting them in layers on screens in a heated room. They should be collected in dry weather, as otherwise the hulling will give trouble.

Although beechnuts are not equal to acorns, yet when properly used they form a food not to be despised.

958 – **Castration in Relation to the Secondary Sexual Characters of Brown Leghorns.** GOODALE, H. D. in *The American Naturalist*, Vol. XLVII, No. 555, pp. 159-169. New York, March 1913.

BREEDING

After a brief introduction in which mention is made of cases of sexual reversion in individuals belonging to species of birds possesing marked sexual dimorphism, and which cases were accompained by lesions of the ovaries in the females and castration of the males, especially in domestic breeds, the writer sets forth the reasons which induced him to select Brown Leghorns for his experiments, namely their adult plumage, which is strongly sexually dimorphic, and is pratically identical with that of the Jungle fowl; the size of the comb of the female; and the fact that there are at least three distinct stages in the development of the young birds' plumage before the adult colour is reached. The first two stages do not exhibit sexual dimorphism, nor are they identical with that of the adult female. Sexual dimorphism appears first in the third juvenile plumage.

The writer describes and collects in tables comparative statements of the chief secondary sexual characters common to all varieties of domestic chickens and those special to Brown Leghorns. He examines minutely these characters. He then reports the results of his experiments. The chickens — male and female — were castrated when they were 21 to 28 days old, that is, much younger than in the case of commercial caponization. Seven of the castrated males reached the age of four months, then three were killed. The autopsies showed an entire absence of testicular material in two cases. The third had a tiny nodule, possibly testicular. All four survirors were kept until they were 16 months of age.

Two were then killed for study. They developed the normal plumage of the male, and were it not for the small comb and wattles they would have had nearly the same appearance as a normal cock. They are, however, somewhat fuller plumaged and rather heavier looking birds than a normal cock. They are less active in their movements, are non-combatants and show no sexual instincts. They have never been heard crowing. One of these capons had much the same appearance as a normal cock, he had a large comb but did not crow; at one time he showed some inclination to pay attention to the hens, but it never went as far as an attempt at copulation. At the autopsy it was found that there had been an autoplastic transplantation of a bit of the testis.

It will have been observed from the foregoing description, that the small comb of these capons is the only character which might be considered female. In all other points the characters are those of the cock, sometimes exaggerated (feather length), sometimes infantile (crowing instinct).

As for the lesser development of the comb, it may be affected by so many conditions that the question as to whether or not the capon has a female type of comb is not easily answered.

Of the hens which were castrated, only one of the females from which the ovary (only the left, since it was assumed that the right had completely degenerated) was removed, reached maturity. There is no doubt as to the effect of ovariotomy on this individual, which passed as a cock with those unacquainted with its history. Nevertheless the assumption of male characters has not been quite complete. First the presence of feathers on the back which are very much hen-like. Second the wing bow is poorly developed. In behaviour the bird showed lack of the crowing instinct, non combativeness and general indifference to the hens. In another castrated female which died at the age of four months, when the first feathers of the third stage began to appear, they were like those of the young male. The later feathers, however, were those of the normal female, owing to the regeneration of the ovary as was found at the autopsy.

These experiments then indicate clearly that while the female Brown Leghorns may assume male characters following the removal of the ovary, the male assumes no positive female characters after removal of the testes.

The writer closes his paper with some considerations of a theoretical nature on the results and on the value of his experiments.

959 – **Breeding-Experiments with Ducks.** — GOLDSCHMIDT, R. in *Zeitschrift für induktive Abstammungs- und Vererbungslehre*, Vol. IX, Part 3, pp. 161-191. Berlin, April 1913.

The writer has been led to publish the results of his experiments by the appearance of two articles by Phillips and Goodale on the same subject. He has used a number of different races and crosses. He has come to the conclusion, already reached by Phillips for total body development, that stature is to be considered a Mendelian character. But whether it is a simple or a complex one is not yet known. The writer's experiments were limited to two generations of descendants.

The article is accompanied by four diagrams and numerous tables.

CATTLE

960. – **A Kansas Calf-Wintering Test.** — *The Breeder's Gazette*, Vol. LXIII, No. 20, p. 1164. Chicago, May 14, 1913.

At the Kansas Agricultural College on May 2 was held a most successful meeting of cattlemen, of whom upwards of 500 were present.

President W. J. Waters gave an illustrated lecture on "How a Steer grows". This lecture was followed by a judging demonstration given by Dr. C. W. Mc Campbell Prof. W. A. Cochel presented the results secured in feeding silage to fattening cattle and C. M. Vestal presented the results of the winters feeding experiment in the maintenance of calves.

With the present prices of beef there is an incentive to carry the calves through the winter in better condition than ever before; the experimental work was therefore confined to economical methods of wintering beef calves.

Early in January, 50 high grade Hereford calves were purchased at $ 32 per head. They were shipped to Manhattan and held a few days in order to overcome the effects of shipping and to fill up well before the experimental work was inaugurated.

Taking into consideration all the expenses incurred they cost $ 7.80 per cwt. at the beginning of the test on Jan. 21. They were divided into five equal lots and fed as follows:

Lot 1, corn silage according to appetite and 1 lb. cottonseed meal per head daily. Lot 2, kafir silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 3, sweet sorghum silage according to appetite and 1 lb. of cottonseed meal per head daily. Lot 4, corn silage and alfalfa hay both according to appetite. Lot 5, alfalfa hay as fed to Lot 4 and shelled corn equivalent to the corn in the silage fed to Lot 4, with corn stover according to appetite. The only difference in the feeding of Lots 1, 2 and 3 was that the silage was made from different crops, such as corn, kafir and sweet sorghum; of Lots 1 and 4 that the protein feed was from different sources: cottonseed meal and alfalfa hay; of Lots 4 and 5 that the corn was fed as silage in one lot and dry forage in the other.

The results indicate that there is less difference between silage from different sources as a feed than there is in the yield per acre of the different crops. Under local conditions sweet sorghum will produce the largest yield of silage, followed by kafir and corn in the order named. The results secured in the test indicate that the ten calves in the first three Lots could be wintered for 100 days on slightly less than 1 ½ acres of silage with an outlay of $ 14 for cottonseed meal. In Lot 4, where alfalfa hay and silage were used, less than an acre of alfalfa and approximately an acre of silage were necessary to carry ten calves for the same period, and in Lot 5, an acre of alfalfa, an acre of corn and stover combined and two of stover alone were required to secure the same result. The value of the silage is thus shown in that it increases the live stock carrying capacity of the farm.

In giving values to the various feeds used, the local price or cost was charged with a sufficient increase to account for the cost of feeding. The important fact of the tests is that when all feeds were used at prices which are decidedy remunerative to the grower, gains were made at an average cost only slightly more than 3 ½ cents per pound. Another fact of almost equal importance is that calves could be purchased at £ 32 per head or $ 7.80 per hundred and fed on the coarsest feeds produced on the farm and yet return an average of $ 5 per head above the cost of feed and labour. The final estimates were based upon feed lot values of $ 7.50 to $ 7.60 per cwt. The entire lot was taken to graze on a ranch during the summer and their further development will be followed in order to secure information on the influence of the winter rations.

961 – **Cattle Raising in Jamaica.** ROBERTSON, T. G. M. in *Bulletin of the Department of Agriculture of Jamaica,* Vol. II, No. 6, pp. 155-158. Hope, Kingston, Jamaica, January 1913.

The writer, referring to the experiments made by Mr. Gosset at Belvidere with Indian and Porto Rico cattle, gives the results of the researches which he has himself carried out at Burnt Ground.

Mr. Roberston considers it necessary to produce a type of cattle in Jamaica which will, as far as possible, combine the size, development and hardiness of Indian cattle with early maturity and an aptitude to fatten well. It should, however, not be forgotten that Jamaica is a tropical country with a tropical climate, and that the first consideration is to prevent calf mortality. Good results were obtained by the writer, who used cows with a considerable amount of Indian blood, and half-bred Devon, Hereford and Shorthorn bulls.

SHEEP

962 – **Wool Production in French West Africa and the Introduction of Merinos.** — DE GIRONCOURT, G. in *Bulletin mensuel de la Société de Géographie commerciale de Paris,* Vol. XXXV, No. 4, pp. 225-239. Paris, April 1913.

The development of the world production of wool does not seem to keep pace with the demand; the Tunisian supply, for instance, is decreasing, and the Argentine stock, an important factor in the market, seems also to be diminishing. This state of affairs has led to the idea of utilizing vast pastoral districts in French West Africa for wool production. Sheep occur throughout Africa, and can withstand more severe climatic conditions than the hardiest zebus. But in the equatorial regions the various breeds have lost many of their primitive characters, especially that of producing wool. The hair of the Central African breeds is unsuitable for weaving; indeed at first sight, they do not seem to differ much from the goats found in the same latitudes.

In the French Soudan, however, chiefly between Djenné and Lake Faguibine, there is a race of woolled sheep, known as the "Macina", which has encouraged hopes for wool production. The fleeces are used in the neighbourhood and the natives of the Niger weave blankets of unbleached wool; these are sometimes quite artistically covered with designs in spots, and fetch 2*s* 6*d* to 20*s* according to quality; the inhabitants wear them on cold winter days, when the thermometer may fall as low as 6° C. (43° F.), at any rate at Lake Debo. A trial of exportation of this wool has been begun and in 1912 the Mopti trading stations sent 200 tons to France and those from Djenné 20 tons. Unfortunately this wool was found to be of such poor quality that it could only be used for mattresses, as the machines could not deal with it owing to its being nearly all coarse hair. Its price on the Niger was £20 to £24 ton, and in Europe £60. These sheep, which were presumably introduced by shepherds from the north and are probably the degenerated descendants of Libyan flocks, are by no means uniform in type; they are a mixture of woolled and non-woolled sheep, and the constant crossing tends to further mix the fleeces.

The Government of Upper Senegal and the Niger has issued a decree to bring about the separation of the woolled and non-woolled sheep; this decree has had some influence, in spite of the difficulties due to the migratory life of the flocks, which travel between the semi-desert Sahelian zone and the lacustrine zone of the Middle Niger. The latter zone, subject to floods from the river, contains enormous reserves of pasturage (*Panicum bourgou*) available for several months in the year; its area is some seven million acres, that is about three times the area flooded by the Nile in Egypt. It should allow of a great increase in the number of sheep and cattle: it is therefore natural to think of increasing the breeding of the woolled Macina sheep, which may be practised also throughout the Sahelian zone, especially in the Fonta-Djallon and the Mossi.

For the improvement of the wool of this breed, the Government of the Upper Senegal and Niger started in 1907 the sheep-farm of Niafunké, between Lake Debo and Timbuktu. In 1908 an unfortunate importation was made: eight rams, four Southdowns and four Rambouillet Merinos from Patagonia, died the following year; next seventeen rams, Algerian, Fine-tailed Barbary and Barbary Merino, were brought from the province of Oran; in 1910 eight more Barbary Merino rams arrived; in 1911, eighty more were brought: Crau Merinos crossed by Barbaries, and Barbaries from Sétif. In November 1912, the flock numbered 101 Algerian sheep, 283 indigenous, 660 half-breds, and 141 three-quarter-breds. The weight of the half bred fleece was 2 $^3/_4$ lbs., while the indigenous sheep give not much over a pound. However, the efforts of a model sheepfarm to improve the produce of the whole country cannot give anything but slow results.

The Chamber of Commerce of Tourcoing, wishing to obtain precise information on the future of the wool-trade in French West Africa, has appointed a Special Commission with M. Henri Dewarin as secretary.

Considering the good results obtained in British East Africa by the continued introduction of Merino rams and ewes from Australia, the Commission believes that the best means of promoting improvement in the production of wool will be to purchase pure Merinos in Australia and keep them at the station in French West Africa as a pure breed, or as crosses with the native sheep.

The writer, who has been consulted by the Tourcoing Chamber of Commerce, thinks that before the Government of the Colony and private persons embark on the expense necessary for an experiment of this sort, it would be well to make a preliminary study in British East Africa and northern Australia, to find out what are the extreme conditions under which woolled sheep can be successfully kept, especially as regards climate and parasites. It is only after most careful enquiry that the acclimatization of fine-woolled Merinos should be attempted under conditions so unfavourable as those of the Soudan.

963 – **Fat Lambs at Ruakura.** — MC CONNELL, PRIMROSE in *The Journal of Agriculture of the New Zealand Department of Agriculture, Industries and Commerce*, Vol. VI, No. 3, pp. 271-273. Wellington, March 15, 1913.

On the 1st of February 1912, 600 Lincoln Romney full mouthed ewes were put to the rams, half to Border Leicesters, and half to Southdowns, at the rate of fifty ewes per ram.

The ewes were then kept in one flock and were constantly removed from paddock to paddock, this accounting for their fine condition when the lambing season commenced. From a week previous to lambing they received a full ration of mangolds and this was the means of keeping up a good flow of milk. The lambs were sold to local butchers having been fed up to the time of being sold in a paddock of rape.

The number of Border Leicester crosses that were sold was 308, and taking into account the value of the ewe's wool, the gross profit realized from each ewe was £ 1 1s 10*d*.

The Southdown crosses sold were 372 and the gross profit per ewe — including the wool — was £ 1 4s 10*d*.

The economical results were thus more favourable for the Southdown crosses which give a superior carcase and come earlier to maturity.

As for weight, though the Border Leicester crosses seem somewhat better.

This season the experiment will be continued on 800 ewes, half being put to the Southdown rams and half to the Border Leicester.

PIGS

964 – **The Utilization of Skimmed Milk and Potatoes by Feeding to Pigs.** — HANSEN in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 13, pp. 264-268. Berlin, July 1, 1913.

The writer, after pointing out the progress that has been made in Germany in the fattening of pigs, thanks to the introduction of English blood in the breeds and to the better way of feeding, describes some new foods and then turns to the practices of pig feeding that have long been current in the north west of Germany. This practice consists in setting the pigs at the age of 10 weeks on a feed composed exclusively of barley and meat and fish meal (a mixture of equal parts of each) upon which at the age of 20 to 24 weeks they reach the weight of 237 to 242 lb. and are ripe for the butcher. For every 100 lbs of live weight at the beginning of this treatment an average of 3.4 lb. of starch value and 0.87 lb. of protein are given, towards the end 2,5 lb. and 0.85 lb. respectively. The daily gains in weight amounted according to the calculations of Prof. Lehmann of Göttingen to about 1,32 lb. per head. The writer is of opinion that this way of producing pork would not be advisable for the East of Germany where it would imply a limitation of hoed crops, a one-sided development of farms, a greater dependence upon foreign food markets as well as a diminished utilisation of skimmed milk and of potatoes. Potatoes and skimmed milk at present yield the highest profit when they are transformed into pork. Experiments conducted by the writer at the Agricultural Institute at Königsberg show that 2*s* 3 ½*d* are realized per cwt (112 lbs.) of potatoes when the daily gain is 1 lb. 7 oz and the price of pigs is £ 2 5*s* 9 ½*d* per cwt. In this calculation the barley that is fed is valued at 7*s* 11 ½*d* and the meat and fish meal at 10*s* 10 ¼*d*. while the general expenses at set down at 12*s* 8 ¾ *d* per head. When therefore unsorted potatoes cannot be sold at the farm at 2*s* or 2*s* 6*d* per cwt. it is more profitable to feed them to pigs. One gallon of skimmed milk when fed with potatoes, barley and flesh and fish meal realizes 1,81*d* per gallon, and in favourable cases as much as 2,14*d* per gal. In view of these results it is advantageous to base pig teeding in the East of Germany on the utilization of the potatoes and dairy by-products of the farm. For the carrying out of this plan of feeding the writer has calculated tables of rations.

POULTRY

965 - **Ostrich-Farming in German West-Africa.** - BERTHOLD H, in *Deutsche Kolonial Zeitung*, Nos. 22-23, pp. 360-362 and 380-382, Berlin, May 31 and June 7, 1913.

The live stock industry is becoming important in German West Africa, and includes cattle, horses, sheep, and goats.

To this list should now be added ostrich farming which is a very remunerative undertaking. The latter industry is of recent growth, for in the 1912 census, only 1300 birds are recorded, and the exports of feathers in 1911 were to a value of £3 960 while those of the Union of South Africa in 1912 attained the value of £2 580 000.

As wild ostriches are very abundant in German West Africa, and may be used for out-crosses, there is no danger of the domesticated birds degenerating from prolonged in and in breeding. Moreover the district has no winter rains which prove so fatal to young birds, especially those hatched late in the season (up to November).

On the other hand suitable fodder plants are lacking, therefore irrigation works must be undertaken to be followed by the sowing of lucerne, the principal fodder crop, and the erection of fences to divide the land into paddocks and to prevent the male birds from fighting. The writer recommends that ostrich farming should be combined with some other class of farming, more especially sheep farming.

The Government of German West Africa have acquired a few domesticated ostriches from Cape Colony with a view to forming a stud at the model farm of Otfituesu where birds will be raised to be eventually used for crossing with the captured wild birds.

Ostrich hunting has been prohibited on German territory.

BEES

966 - **Consumption of a Hive of Bees during the Year.** — HOMMELL, R. in *La Vie agricole et rurale*, Year 2, No. 22, pp. 653-655. Paris, May 2, 1913.

The reasons for the consumption of food in a hive of bees are as follows: 1) maintenance of the life and activity of the bees, in the hive and outside; 2) feeding of the brood; 3) secretion of wax; 4) feeding of the drones.

The daily consumption of a bee varies from 0.003 gm. to 0.12 gm., according to the conditions of life, with a fairly general mean of 0.03 gm. The total food consumed by a worker larva in its feeding period is 0.4 gm; the daily consumption of a drone is 0.04 to 0.05 gm.

With these data one may attempt the calculation of the total consumption during the year, taking a strong swarm in a large box hive, in a district where there is one great honey period lasting a month; the different phases of activity and consumption may be summed up as follows:

Period	Average population of the hive	Workers at work:						Total consumption
		in the hive			collecting honey and wax			
		Number	Consumption: per bee per day	Consumption: total for the period	Number	Consumption: per bee per day	Consumption: total for the period	
			gm.	kg.		gm.	kg.	kg.
February	20 000	20 000	0.006	3.6	—	—	—	3.6
March-April . . .	40 000	30 000	0.03	54.0	10 000	0.06	36	90.0
May	60 000	40 000	0.04	48.0	20 000	0.06	36	84.0
June	80 000	40 000	0.06	72.0	40 000	0.12	144	216.0
July-August . . .	60 000	40 000	0.04	96.0	20 000	0.06	72	168.0
Sept.-Oct. . . .	40 000	40 000	0.03	72.0	—	—	—	72.0
Nov.-Dec.-Jan. .	30 000	30 000	0.006	16.2	—	—	—	16,2
							Totale . . .	649.8

For calculating the consumption of the drones, one may reckon 1500 in a strong hive, and the time during which they occur is about two months, separated into two or more periods by intervals during which there are none.

Taking Godon's figure of 30 gms. (just over 1 oz) for the daily consumption of 1000 drones, it is found that the 1500 consume in two months 2.7 kg. (6 lbs.). This will give a total of 650 kg. (1430 lbs) in round figures, for the maintenance of the life of the hive. But this amount does not represent finished honey as it is taken from the hive, but a nectar-like substance containing 75 or 80 per cent. of water; this would give 182 kg. (400 lbs) of honey. To this amount must be added the food required by the brood.

The bee-population renews itself four times in the year; but this replacement does not extend to the whole 80 000; taking it on 60 000 only, we get 240.000 larvae to be reared. Each larva requires a minimum of 0.5 gm. of bee's bread, making a total of 96 kg. (211 lbs.); reckoning that this consists of one-third each water, pollen and honey, the honey consumption for the brood is 32 kg. (70 lbs).

There remains the secretion of wax. With all the frames moveable the bees get back all the section emptied by the extractor, or failing them waxed sections ready for them to build upon; but M. de Layens' experiments show that it is better to let them build about five sections of 15 sq. ins. each containing a total of 660 gms (1 ½ lb). of wax. This amount is produced economically and without diminution of the yield of honey, but at the same time it means about 7 lbs. of food per pound of wax, or for the 1 ½ lb., about 10 lbs.

These estimations put together are as follows;

Maintenance of the bees	400 lbs.
Feeding of the brood	70 »
Wax production	10 »
Total . . .	480 lbs.

Although this figure seems large, the writer considers it is probably too small really; he points out that bees work much more to live than to save, as if the hive under consideration gives an average of 45 lbs. of honey it needs more than ten times that amount of food to produce it.

SILKWORMS

967 - **Silkworm Rearing in Tropical Countries.** — FAUCHÈRE, E. Le ver à soie. — *Bulletin économique de Madagascar et Dépendances*, Year 13, No. 1, pp. 92-111. Antananarivo 1st quarter 1913.

The writer believes that the information collected by him, based on experience in Madagascar will be of general bearing for tropical countries.

It is generally believed in Europe that the monovoltine and polyvoltine silkworms belong to quite different races. But experiments on one race reared in different climates allow the conclusion to be drawn that any particular race may be both monovoltine and polyvoltine. If silkworms fron Southern Europe of annual or monovoltine races are taken to a tropical climate, they eventually adapt themselves to the new conditions of life, becoming polyvoltine. This has happened with all the annual races introduced into Madagascar, as well as to Guatemala and other parts of Central America. It is well known that atmospheric conditions exercise a great influence on the quality and quantity of silk; but this is not sufficently considered when it is stated that a race which has become polyvoltine is degenerate and will inevitably give inferior silk. The truth is that these polyvoltine races are kept in countries in which the climatic conditions are not suitable, and are always reared by natives who are by no means careful or expert.

The results obtained in Central Madagascar and at Réunion show that European silkworms, when acclimatized to the new conditions and changed to the polyvoltine state, continue te produce a silk equal in quantity and quality to that oblained in France.

It seems to the writer that the silkworm should be considered as an insect of tropical climates (constant temperature), and the monovoltine state as an artificial one produced by the rearers to adapt it to the European climate (variable temperature). Observations of practical breeding allow one to state that very hot and moist climates of the equatorial and tropical zones do not allow the production of silk of first quality. But the climate of Central Madagsscar, as well as that of the high parts of Réunion, seems to suit the silkworm admirably. Further, practical observations have shown that moistness of the atmosphere, which is so harmful in countries with a variable temperature, has no bad effects in tropical countries, unless it remains near saturation point for several days in succession.

The production of silk from *Bombyx mori* can be undertaken in all very hot, and even very moist, tropical countries, but first-class cocoons can only be expected in mountainous parts, where the temperature is not very high, insolation is intense, and winds are frequent, all of which conditions occur in Central Madagascar.

Number and period of the rearings. — In this district the silkworm moth has five generations per year; but one of them, occurring in the cold season, cannot be used for industrial rearing. From the hatching of the caterpillars to the collecting of the cocoons about 45 days elapse, so that if eggs ready to hatch were to be had, at least six crops of cocoons could be got in the season, lasting from the middle of September to the middle of May. From the middle of September to the end of November the silkworms do splendidly; December is generally very rainy, so it is better to arrange not to rear any worms during this period.

Nurseries. — There is so far no general agreement as to the type of nursery best suited for tropical countries. It has been asserted that nurseries built on the European plan, with plenty of openings to ensure continuous and thorough ventilation, are unsuitable for the conditions in Indo-China; in Madagascar, however, the silkworms give better results the more thoroughly the nurseries are ventilated. They may be made of sun-baked or unbaked bricks, with tiled or thatched roof; it is better to raise the ground-level a little to keep out moisture, and to make a flooring, which may be simply of well-beaten clay. The advisability of making a ceiling is indisputable; but all the same many European rearers in Central Madagascar get good results without.

The arrangements for aspect of the rooms, lighting and disinfection and inside treatment of the nurseries are the same as for silkworm rearing in Europe.

The temperature at Antananarivo during the rearing season (mid-Sept. to mid-May) varies between 18° and 25° C (64° and 77° F.); there is therefore no urgent need for heating; but still, to avoid prolonging the first and last rearings beyond 37 or 38 days, it is as well not to let the temperaturure fall below 19 or 20° C (66 or 68° F.). In the higher parts heating must go on till the middle of November, and even during hibernation to prevent dampness.

Feeding. — In Europe it is said that the age of the leaves ought to keep pace with the age of the caterpillars; in Madagascar caterpillars in the fourth or fifth stage can manage four-months old leaves quite well. The number of times fresh leaves are given per day varies; the hotter and drier the weather the more often must this be done. When the caterpillars are young they should be fed eight or ten times a day; later six is enough. But in the fifth stage they must be fed so that they are never without leaves. From observations at the Silkworm Station at Nanisana it appears that to rear an ounce of eggs (1) about 1200 lbs. of leaves are required: they must be carefully sorted and cleaned. The weight of leaves eaten during the different stages is as follows:

1st stage	0 ½ lbs
2nd »	16 »
3rd »	61 »
4th »	194 »
5th »	915 »

Length of stages. — In Madagascar the stages are slightly shorter than in Europe, with the exception of the last, which brings the whole larval period to about the same as in France. The following are the figures:

1st stage	5–7 days
2nd »	4–5 »
3rd »	5–6 »
4th »	6–7 »
5th »	11–13 »

Killing and drying. — For killing and drying the cocoons, the various methods used in Europe may be employed; but in countries in which polyvoltine silkworms are reared and the spinning can go on for six or eight months in the year, machines of smaller capacity can be used than in Europe. It would be possible to make simple machines for hot countries by doing away with the motor and the ventilator, thus realizing a considerable economy. Driers similar to those used for fruit, with circulation of hot air, might be used. In Indo-China a type of drier invented by M. Emery, simple and easily transportable, is much employed. This drier consists of a little square or rectangular fire-place, above which are arranged small compartments fitting exactly one on top of another. The bottoms of the compartments, on which the cocoons are piled, should be of wire netting; the hot air passes up through the cocoons and at the same time kills them and dries them.

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(1) Ounce of 25 gms.; the ounce avoirdupois = 28 gms. (*Ed.*).

Diseases and enemies of silkworms. — Of all the diseases attacking silkworms in Madagascar, the " grasserie ", considered very unimportant in Europe. is the worst. Predisposing causes are: lack of ventilation, excessive heat, and in particular the use of too young leaves.

Among the enemies, ants and rats devour both the caterpillars and the cocoons. Further, there is a fly, known as "oudji" in Japan, which oviposits in the caterpillars; the larvae developing within kill the caterpillar before it spins; a caterpillar with only one or two of these larvae in it spins a cocoon with little silk in it, and dies as a chrysalis. This fly is common in the silkworm-rearing parts of Asia; in India it is called the " silkworm fly ", in Indo-China "kuji" and "connhang", M. Vieil speaks of another fly, which attacks the caterpillars when they climb up to spin, and whose sting is immediately fatal.

The "landibe" (*Borocera madagascariensis*) is attacked by flies which seem to be related to the "oudji", but so far these have not been recorded from the silkworm nurseries.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

968. – The Development of Agricultural Machinery during the last 25 Years. – FISCHER, G. in *Maschinen-Zeitung*, Year 11, No. 12, pp. 141-150. Berlin, June 15, 1913.

The paper reviews the important progress that has been made in agricultural and auxiliary machinery during the last 25 years. Considerable improvement has been effected in connection with motors driven by heat, and agricultural portable engines have attained, thanks to superheated steam, a degree of perfection which allows a great saving of water and of fuel. Equal improvements have been effected in liquid fuel and electric machines. As for machines for tilling the soil and for preparing forage, the progress has been chiefly in the direction of improving those machines which existed already in a general form 25 years ago.

The writer next examines briefly the work done in connection with dairy machines and lastly the great changes accomplished in the esiccation of agricultural produce.

969 – Competition of Machines for Tilling the Soil, at Chulnitza, Rumania. – THALLMEYER in *Deutsche Landwirtschaftliche Presse*, Year XL, No. 46, p. 557. Berlin, June 7, 1913.

The following firms took part in this competition, which was held from May 25 to 28: Lenz of Mannheim with his motocultivator built on Köszegi's system; Bajac of Liancourt, France, with a cable outfit consisting of a benzin tractor and balance plough, machines which in the competition belonged to different classes. The real plough tractors, with gang ploughs, which took part in the competition tests were the following: Hart-Parr, Caterpillar, Big Four, Twin City and Pioneer, the last two of which were tried for the first time in Europe.

The trial consisted of ploughing 24.7 acres to a depth of 7.08 inches. The American tractors worked with eight-furrow ploughs (Hart-Parr, Big Four, Pioneer), with ten- furrow ploughs (Caterpillar), and with twelve-furrow ploughs (Twin City); Bajac's outfit worked with a three-furrow balance plough. The Chulnitza competition was organized by the syndicate of the Jalomitza district farmers. The ground on which the tests were made was perfectly flat and in the most favorable conditions of moisture. The judges have not published the results of the competition.

970 – **The Competition of French Beet-lifting Machines.** in *Blätter für Zuckerrübenbau*, Year XX, No. 10, pp. 146-151. Berlin, May 31, 1913.

This competition was held at Corbeaulieu near Venette (Compiègne) in October 1912. The soil of the field in which the machines were tried was a deep loam, The crop was estimated at 10 to 12 tons per acre.

The firm Bajac of Liancourt presented a lifter for three rows of beets which seemed well built and easy to handle. Each row is lifted by two shares which end in a rounded extremity and which with the forward motion of the machine lift all the earth round the beets. The ground was loosened to a depth of about 5 inches.

While this machine represents a simple beet lifter which, however has given satisfactory results, M. Degrémont, a machine builder of Le Cateau (Cambresis), presents a lifter and topper which lifts the beets, tops them and lays them in little heaps. In order to obtain this result it required two apparatus working, one after the other, on three rows at the same time. The topping machine required 4 oxen, a driver, and a workman.

The lifter and cleaner presented by the same firm is in many respects noteworthy and is provided with several special devices which mark considerable progress in this direction. One advantage is that very few beets are damaged or broken and that the field is not grubbed up but remains in a condition for carting to be carried out, as the apparatus does not penetrate too deeply into the soil.

At the competition several other lifters and cleaners were presented but they were designed only for one row at a time, and this from the point of view of economy and the amortization of the machine is not sufficient.

The Société Anonyme Massart of Liege exhibited a lifter with two shares.

In this competition the most successful firms were Degrémont and Bajac. The experiments yielded abundant results and prove that in France the solution of this problem interesting both to agriculture and to the sugar industry is receiving now much attention.

971 – **The Pilter Tractor.** MANRIN in *Bulletin de la Societé d'Encouragement pour l'Industrie Nationale,* Year 112, Vol. 119, No, 5, pp, 705-708. Paris May1 913.

The experiments made with this tractor (14 HP) by the Agricultural association of Gien have given the following results :

Plough used	Heavy Oliver Plough (2 wheels, one furrow)	Cockshutt Sulky Plough (3 furrows)
Labour	1 Mechanic 1 Labourer	1 Mechanic 1 Labourer
Depth of furrow	9 ½ inches	5 inches
Breadth »	13 ½ »	29 ½ inches
Avetage power,	926 lbs.	882 lbs.
Duration of experiment	30 Minutes	28 Minutes
Duration of work	21 »	24 »
Total area plonghed	487 sq. yards	1259 sq. yards
Velocity per second	36 ½ inches	38 ½ inches
Work transmitted to plongh in H P.	5.18	5.2
Consumption of fuel per HP in gallons.	0,382	0.417
Volume of earth loosened per gallon of fuel.	191 ¼ cubic yards	205 cubic yards

972 – **Meyenburg's Motocultivator.** — DE CONDÉ in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale,* year 112, Vol. 119, No. 5, pp. 699-704. Paris, May 1913.

This is a description and illustration of Meyenburg's motocultivator, the characteristic feature of which is the special construction of the milling teeth. They are of bent steel wire about one-third of an inch in diameter. They are flattened out at one end to a breadth of half an inch. The other end is fastened to a not completely closed ring by means of which they are attached to the shaft.

This machine has given the following results at a trial made at Bourges.

	1st day	2nd day
Breadth of work done	6.56 ft.	6.56 ft.
Average depth of do.	3.9 inches	4.73 inches
Velocity per second	6.7 »	6.69 »
Total area worked	5022 sq. yards	14. 35 sq. yards
Time required per acre	3h. 34 min.	3h. 34 min.
Consumption of benzol per acre	9.95 gals.	9.95 gals.
Volume of earth loosened per gallon of benzol	51.86 cub. yards	51.86 cub. yards

573. – **Portable Wheat Esiccator.** – HÖLTZERMANN in *Deutsche Landwirtschaftliche Presse,* Year 40, No. 46, pp. 554-555. Berlin, June 7, 1913.

This esiccator, wihch of late years has spread widely in Russia, gives very good results. The writer with the help of illustrations showing elevations and longitudinal section of the machine describes its construction and *modus operandi* and gives also an estimate of the cost of working with it. The essiccation is obtained by the direct products of combustion of the fuel contained in a small fire box, which by the suction of a powerful ventilator are obliged to pass through a shallow layer of the grain to be dried. The grain is kept continuously in motion by a very ingenious stirrer. It is driven by a gin, portable or any other power engine.

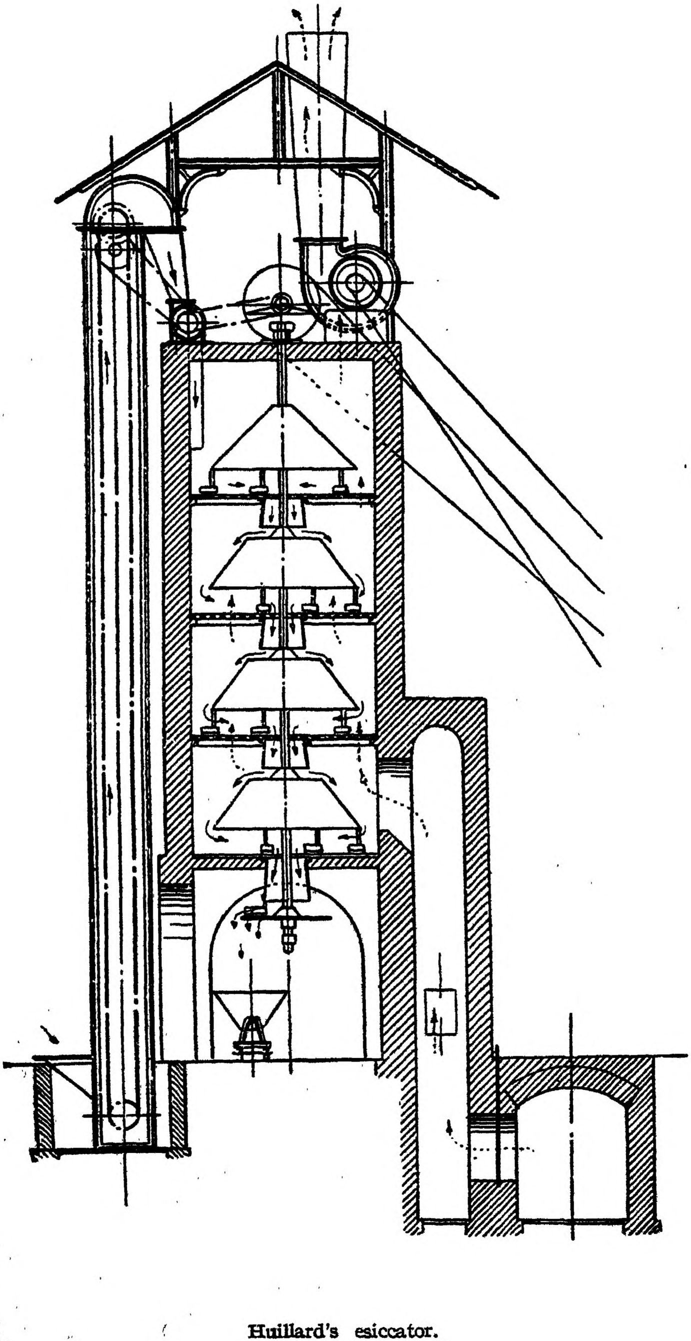
At present the apparatus is built in two sizes which, cost respectively about £ 80 and £ 90.

974. - **Continuous Drying Apparatus for Agricultural Industries.** - DE CONDÉ in *Journal d'Agriculture pratique*, Year 77, Vol. 1, No. 20, pp. 632-634. Paris, May 15, 1913.

This esiccator consists, as is shown by the annexed figure, of a yclindrical tower divided horizontally by perforated plates. A shaft supports conical distributors over each plate. The heated gases enter at the lower extremity of the tower and rise to the top while the stuff to be dried descends, so that the warmest gas comes into contact with the driest stuff. Heat is generated in the fire place at the foot of the tower and is forced through the apparatus by an exhauster at the top.

In the figure the direction followed by the stuff to be dried is shown by full arrows, that of the heated gases by dotted arrows. The temperature of the gases is regulated by the admission of cold air.

The Huillard esiccator used at the Nag Hamadi (Egypt) sugar mills has given the following results: The weight of the stuff to be dried was 103 ½ tons. The degree of moisture on entering the apparatus was 81.5 per cent. and on leaving it 35 per cent. The weight of the water evaporated was therefore nearly 74 tons. The temperature of the gas at its entry into the tower was 278° C; at its issue 52° C. The power required by the ventilator was 25 HP. and by the drying apparatus 5 HP.



Huillard's esiccator.

975 - **Trial of a Groat Mill.** — GIESELER in *Landwirtschaftliche Zeitschrift für die Rheinprovinz.* Year 14, No. 23. pp, 392-393. Bonn, June 6, 1913.

The results obtained during the trial of the mill are shown in the following table:

Cereals ground	HP. required	Lbs. grouud per HP.	Cost of electricity in pence per cwt.
Barley: coarse	3.50	161.0	07.2
medium	12.85	89.7	11.9
fine	9.10	82.7	13.1
Rye: coarse	2.60	176.3	06.6
medium	3.80	161.2	07.2
fine	5.35	110.4	10.2
Oats: coarse	7.80	129.3	08.4
Wheat: fine	13.80	144.4	07.2
Maize: fine	8.30	112.4	10.2
Peas: fine	13.35	164.6	06.6

General results: The groat mill size III gave the above results without any trouble or drawbacks. Its management is very simple, its construction is solid and durable and the devices for lubricating are good. It costs 500 Marks (about £ 25).

976 - **Apparatus for Smoking Meat etc.** — MARTINY. B. in *Mitteilungen des Verbandes landwirtschaftliche Maschinen Prüfungs-Anstalten,* Year 7, Part 1, pp. 1-5. Berlin, 1913.

This apparatus has been submitted to a two years trial at the Halle machine experiment station. It is built entirely of metal; The framework is of angle iron, the walls are of galvanised iron plates, the edges of which are folded over each other and bolted. In the lower part of the apparatus a movable fire box is situated and countains the fuel, sawdust on twigs or wood shavings. By means of some vertical partitions the fire is obliged to follow a serpentine course, end thus lasts longer. Between the fire box and the space in which the meat is hung there is a double bottom of sheet iron enclosing a space in which the smoke is dried, cleaned and distributed. The whole apparatus is set up near a chimney with which it is connected and which carries off the escape smoke. These apparatus are built in varions sizes ranging from £2.10*s* to £12.10*s*.

The judgement passed upon these apparatus is the following: Weber's smoking apparatus is easy to manage, it does not take up much room, it is durable and safe, it allows of a continuous production of smoke; and gives good uniformly smoked products. It is also suitable for keeping smoked meats. It can therefore be recommended for dometic use both for smoking meat and sansages and for storing the same.

977 – **Review of Patents.**

Machines for Tilling the Soil.

260 626 (Germany) Disk plough with cable traction.
60 016 (Austria) Motor plough.
60 203 (Austria) Motor plough.
60 015 (Austria) Harrow with rotating implement shafts arranged obliquely to each other and to the direction in which it travels.
255 592 (Belgium). Motor plough.
1 062 198 (United States). Subsoil plough.
1 063 928 (United States). Plough.
1 064 149 (United States). Combined Weeder and Cultivator.
1 064 038 (United States). Harrow.
454 864 (France) Improvement in one or multiple furrow balance plough.
454 856 (France) Swing plough with helicoidal mould board.
4 576 (England). Motor ploughs.
5 558 (England) Harrows and cultivators.
130 806, (Italy). Steam outfit for mechanical tilling of the soil.
130 871, (Italy). System of ploughing with mould boards having a convex surface turned outwardly.
128 529 (Italy). Device for automatically lifting and stopping harrows.
60 436 (Switzerland) Motor plough.

Manure distribuiors

5 484 (England) Manure distributing machine).

Sowing machines.

251 499 (Germany). Sowing machine for beet and similar seeds.
60 017, (Austria). Potato laying machine.
60 022, (Austria). Drill with sowing wheels inside the hopper.
1 062 766, (United States) Seed Planter.

Mowing Machines.

259 463 (Germany). Mowing apparatus for reeds.
60 215, (Austria). Mower.
1 063 305, (United States). Attachment for mowing machines.
454 924 (France). Lawn mower.
4 157 (England). Grain harvester and binder.
60 250, (Switzerland) Auto-mower.
60 437, (Switzerland). Knife for mower.

Machines for lifting root crops.

259 388 (Germany). Discharge wheel for potato harvester with oblique running throw wheel.
60 223, (Austria). Beet lifting plough.
255 501, (Belgium). Potato lifting machine.

Machines for cleaning grain and seeds.

1 063 834, (United States). Threshing machine.
4 247 (England). Threshing machine.
4 442 (England). Grain separating machine.
130 805 (Italy) Cylinder and concave for threshing machine.

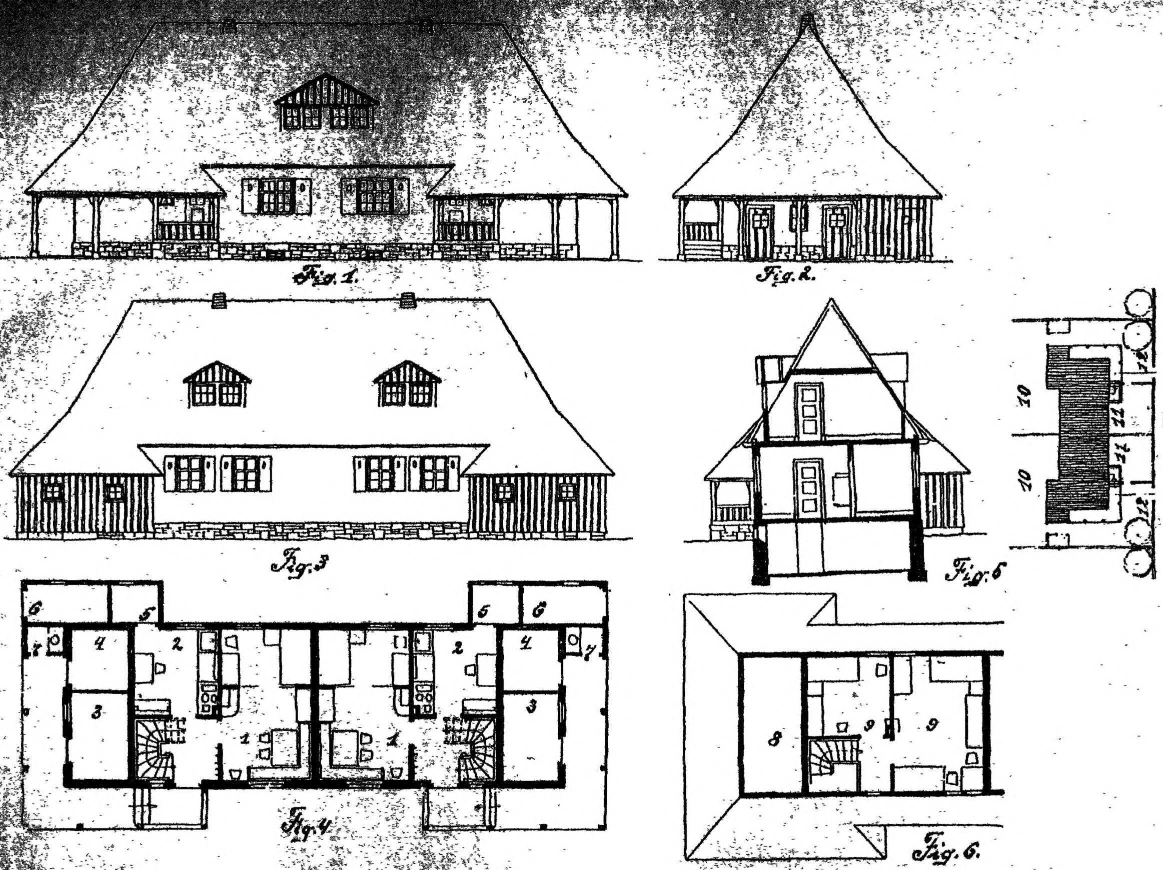


Fig. 1.
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Fig. 4
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Fig. 6.

Plans, elevations and section of house for two families of farm labourers.

Other agricultural machines and implements.

259 318 (Germany) Device for pulling the tying material in straw presses (Annex to Pat. 259 317).
60 020 (Austria) Coffee cleaning machine.
1 063 810 (United States) Grinding mill.
1 064 489 (United States) Milking machine).
1 064 645 (United States) Cotton chopper.
454 964 (France) Apparatus for sulphuring.
5 248 (England) Sheep dip.
60 251 (Switzerland) Machine for sharpening scythes.

BUILDING-CONSTRUCTION

978. - **Prize Designs for Double Dwelling House for Agricultural Labourers.** HÜTTIG, E. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 35, pp. 428-429. Berlin, April 30, 1913.

In the special section of agricultural buildings, of the International Building Exhibition at Leipzig (1913) the designs shown on the annexed plate were awarded the first prize. The plan is very simple (kitchen and dwelling room).

The stables are immediately adjoining the house. Thus, besides other practical advantages, a more compact and effective roof is possible. In front of the door and round the stables the roof is prolonged so as to cover spaces for the pantry, shed and closet; the entrance is also covered so that the closet may be reached under cover. The house is provided with an underground cellar, It is situated a few yards back from the road, leaving space for a small garden and yard enclosed by a hedge along the road. The walls of the cellar are of stone, the others of brick. The heating is so arranged that the heat produced by the kitchen fire can be utilized for warming the dwelling room and the rooms in the roof. The inner fittings of the house are very simple. The cost of such a house is about £ 170.

In the annexed plate the figures show respectively the front, side and back elevation, also ground plan, cross section, roof story and general plan.

In Fig. 4, (1) is the dwelling room, (2) the kitchen, (3) the goats' stable, (4) the pigsties, (5) and (6) pantry and implement room, (7) the closet. In Fig. 6, (8) is the hay loft and (9) the bedrooms. In Fig. 7, (10) is the field, (11) the garden, (12) the yard and (13) the road.

RURAL ECONOMICS.

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979 - **Dairying without Breeding:** Researches on the Nature, Spread and Changes in the Factors of Profit in Dairying without Breeding, with special Regard to the Conditions of the Rhine Province and of Westphalia. — WÜSTENDORFER, KURT in *Landwirtschaftliche Jahrbücher*, Vol. 44, Part 4, pp. 529-639. Berlin, May 20, 1913.

The writer distinguishes two principal types of dairy farms, those that do not breed, that milk only (reine Abmelkwirtschaft) and those that breed (reine Zuchtwirtschaft); Between these two there are intermediate forms. The characteristic difference between the two extreme forms consists in the way the cattle is replaced : by purchase, or by breding on the farm itself, in the length of time that the animals stay in the farm, in the way the calves are utilized, and in the kind of feeding. Each form has its pros and its cons. The milking farm requires less, and less careful, work, it favours a rapid turn over of capital, it facilitates the adaptation of the production of milk to the demand, and it allows the most intense utilization of existing buildings, while it furnishes excellent manure due to the consumption of large quantities of concentrateds. On the other hand the danger from cattle diseases is very great and a number of good cows that would still be useful for breeding purposes are withdrawn.

As factors of the profitableness of the above type of dairy farms, the writer mentions the conditions of labour, of the forage market and of the milch-cow market, the cost of production of milk and its sale price. He discusses the changes in these factors which he has collected in numerous tables from observations made during the last ten years in the Rhine province and in Westphalia, where this kind of dairy farms is fairly numerous.

The wages of day labourers, of farm hands, especially of Swiss stable men have risen considerably. The difficulties with the farm servants and labourers (changes of situation, breach of agreements etc.) have increased considerably on account of the great industrial development of the district.

Concentrated foods have, on the whole, become much dearer, so that the greater cost per cow and per year due to this item amounts to £ 3 15*s* 6*d*, as an average of 11 farms. This increase in the cost will be easily understood if one bears in mind that with the two-fold object in view : production of milk and of meat the consumption must be heavy both as to the total nutritive elements and as to the protein contents. Some of these farmers indeed often carry the intensity of feeding beyond the limits of sound economy, so that, as may be seen from these observations, the feeding becomes irrational and the profits of the concern diminish, for here also the law of decreasing returns holds good. In this connection, both in the production of abundant and cheap forage by a better rotation of crops and in the selection of concentrateds (with due regard to prices and to special effect), there is room for a good deal of improvement.

For the aims of these milk farms only the best animals of those breeds that combine an abundant yield of milk and an aptitude for fattening are used. But the prices of good milch cows have, during the last decade, with the exception of a few bad years, increased extraordinarily owing to the greater demand, the clains of middlemen and the development in the breeding of pure races. Thus for instance the market prices at Dinslaken and Neuss have risen by an average of £6 5*s* or 39.7 per cent.

The greater expense thus caused by the purchase of the cows is partly compensated, other conditions being equal, by the increase, especially during late years, in the price of the discarded cows sold to the butcher. (This increase has been, on average, during the ten years between 1901-1911, and at the Cologne, Crefeld, Aix-la-Chapelle, Düsseldorf, Essen and Dortmund markets, of £1 12*s* per cwt. por 34 per cent. live weight. Nevertheless the "loss per cow" that is the difference between the purchase and the sale price is greater now than it was ten years ago.

Besides the above causes, the modern hygienic requirements also tend to increase the cost of production of milk.

Among the causes which have acted against the increase in the price of milk the writer mentions the extension of the milk trade, due to the progress of technique and to the introduction of a sliding scale tariff for the conveyance of milk by rail, the low cost of the production of milk in breeding districts situated at a distance from industrial centres and the activity of the organizations of the milk trade. Nevertheless, in consequence of the ever increasing demand, and perhaps also of the action of organizations of producers, in reality there has been an increase in the price of milk, to such an extent that no decrease of general and considerable profit is to be apprehended in these farms when situated in suitable localities and making good use of concentrateds. On the other hand, the writer considering the lower cost of producing milk and the high value commanded by milk in the breeding farms, considers it possible that the latter have become more profitable and have diminished the power of the milking farms of competing with them.

In selecting between these two types of farms the following factors are the weightiest.

1. The price of milk and the position of the farm as to means of communication.

2. the personality of the manager of the farm.

3. The size of the farm.

4. The quantity and the quality of the available forage, not possessing market value, which is produced by the farm, and of the by products of the agricultural industries.

5. The existing and the possible proportion of meadows and pastures.

In milk farms, without breeding, the amount of labour and of capital required by every head of cattle is considerable, consequently adequate net returns are only possible where the gross returns are also high, that is, where the price of milk is high. This price cannot be determined in general, owing to the very varied economical conditions of the several farms and their positions as to facility of transport.

As for the position of the farm as to means of communication, as a rule, the capacity of a milk farm to stand competition diminishes the further it is located from a market.

The proper management of a milk farm requires a throughly capable man ; be must know how to value the aptitude of a cow to produce milk and meat, he must be able to hold his own against the dealer and he must understand feeding animals so as to make the best of the condition of the market of concentrated foods. These qualities, with the exception perhaps of the first are generally more often found among the large proprietors than among the small ones. Even in the selling of milk and the buying of cattle, the former enjoy a certain superiority over the latter who are often completely at the mercy of the dealers.

The quantity and the nature of the by products of agricultural industries are of decisive importance in the selection of the type of farm when these foods are to be utilized in one's own farm. The feeding of large quantities of fresh or ensilaged beet root pulp, beet root leaves and rye distiller's wash can easily be more injurious to cows in calf than to milch-cows; and they may sometimes, when no drying apparatus is available induce the manager to turn his farm into a milk farm and in some cases even force him to do so.

Not only the actual, but also the possible proportion of pastures and meadow to arable land must be taken into consideration in selecting the type of farming to be adopetd; the climate (amount of rainfall) and the conditions of the soil determine the possibility of laying down pastures which are perhaps already necessary for the success of the partial milk farms (in which the best cows are put to the bull once or twice) and are absolutely indispensable in the partially and wholly breeding farms.

During the last ten years the increase and decrease of the numbers of these two types of farms in the Rhineland and Westphalian industrial districts has been the following: from 1904 to 1907 a great increase of breeding farms took place, without however any diminution in the milk farms, in 1908 there was an increase in the number of milk farms at the expense of the breeding farms; in 1909-1910 the latter diminished both absolutely and relatively, without an absolute increase in the milk farms; in 1911 there was an increase of the former and a decrease of the latter. Whether this decrease is due to economical reasons or to the exceptional character of 1911 will not be conclusively known until the figures for 1912 and 1913 will be available. Should these figures show a further absolute and relative increase in the number of young cattle, it will be demonstrated that the economical limit of the milk farms had been considerably overstepped during the years 1908-1910 and that the economic changes in the forage, cattle and milk markets have induced farmers to change the type of their farm where milk farming was no longer advantageous.

980 – **The Butter Problem.** CARTER PLATTS, W. in *The Field*, Vol. 121, No 3145, pp. 628-683. London, April 5, 1913.

A few years ago, at the cost of £. 1600, Major R. F. Roundell equipped a modern dairy on his estate at West Marton, near Skipton (Yorkshire). It was established not as a profit-making concern for the owner, but for the benefit of his tenant farmers. The books have been open to the writer for the purposes of the above article.

A large portion of the milk, amounting to almost half the total receipts, is sold again as fresh milk and the bulk of the remainder is separated for butter making, there being a good market for the separated milk in the poorer parts of the industrial centres. Cream and cheese are also sold, and all waste products are consumed by pigs.

The milk is bought at 5 3/4 d. per gallon in summer and 7 1/2*d* per gallon in winter; these prices are low, but there are certain compensating advantages from the farmers's point of view in being able to dispose locally of his total milk produce.

During the last completed working year, 98 636 gallons were received from farmers occupying 1676 acres of grass land. Of this, 44 160 gallons were sold as new milk and 856 galls. were made into cheese; the rest was separated and produced 3 310 ½ galls. of cream; 2252 ¼ galls. of cream were made into 13504 lbs. of butter and 32 837 galls. of separated milk were also sold. The Profit and Loss account for the same period shows the following figures:

	£	s	d
Purchases	2865	2	6
Working expenses	590	10	4
Depreciation of plant	99	9	0
	£ 3555	1	10
Total Receipts	£ 3847	16	7 ½

When book debts and values of stocks had been adjusted, a net profit of £188 1*s* 4 ½*d* was shown; while half this sum was put into a reserve fund, the remainder was distributed as bonuses amongst the tenant farmers, proving equal to an additional farthing per gall. on the price of the milk they had brought in.

981 – **The Economic Causes of Decreased Milk Production in Austria-Hungary.** — ERLBECK, ALFRED R. in *Milchwirtschaftliches Zentralblatt*, Year 42, Part 11, pp. 338-341. Hannover, June 1, 1913.

The writer attributes the decrease in milk production in Austria-Hungary to the declining interest displayed by farmers in cattle raising consequent upon the great rise in the price of food stuffs, and also to the large outlay of capital required for modern dairy equipment. The same reasons have caused the small holders to abandon the industry, and led to its gradual concentration into the hands of the large producers and in the districts which are more favourably situated as regards means of communication. As a means of increasing milk production the writer recommends the encouragement of cattle breeding, especially with regard to pure bred stock and good milk yields, by means of societies for the control of milch cows, and the adjustment of the price of milk by the agency of town depòts to which the milk can be consigned.

982 – **Intensive Feeding of Milch Cows.** — HÖCKNER. Ist intensive Milchviehfütterung nach Leistung auch in einem Zuchtstalle ohne Schädigung der Zucht durchführbar und rentabel? — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 32, pp. 388-389, No. 33, pp. 403-404, and No. 35, pp. 429-430. Berlin, April 19, 23 and 30, 1913.

Since February 1910, the writer has been practising on his estate of Langenzinne near Freiberg in Saxony the intensive feeding of milch cows according to their performance. The animals were divided into lots and Kellner's system was followed.

In the present article he gives the advantages accruing from this method of feeding his animals, *viz.*: greater regularity in milk production, lengthening of the lactation period, better health and condition, less loss from abortion, reduced mortality among the calves, higher money return per cow, saving in bulky food. In conclusion, the writer gives his expenses and returns according to his cow-keeping books for the years 1909, 1910, 1911 and 1912 (up to October 1): See table pp. 1282-3 (1).

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(1) As the results for 1912 deal with only 9 months, we have only given the data for 1909, 1910, and 1911. (*Ed*)

Cow-Keeping Expenses.

1909

1. *Bulky food.*

a) Winter:

		Marks
6 kg. hay at 5 M per quintal.	0.30 M.	
Distillers wash	0.08 »	
15 kg. mangolds at 1.4 M. per q.	0.21 »	
5 kg. straw at 3.00 M. . . . . »	0.15 »	
210 days at	0.74	155.40

b) Summer:

		Marks
50 kg. clover at 1.20 M. per quintal	0.60 M.	
2 kg. straw at 3.2 » »	0.08 »	
155 days a	0.68	105.40

2. *Concentrated food.*

for 66 cows	q.	Marks
Wheat bran	120.15	1 504
Crushed Russian barley .	—	—
Pea-nut meal	58.90	1 025
Brewer's grains	59.00	650
Dried sugar beet slices. .	132.50	1 537
Dried potato flakes . . .	12.30	219
Best linseed meal	—	—
Sesame meal	—	—
Palmnut meal	—	—
Maizena.	—	—
Cottonseed meal.	—	—
	382.85	4 935
per head . . .		74.77

1910

1. *Bulky food.*

a) Winter:

		Marks
6 kg. hay at 5 M. per quintal	0.30 M.	
Distillers wash	0.08 »	
15 kg. mangolds at 1.4 M. per q. .	0.21 »	
5 kg. straw at 3.00 M	0.15 »	
210 days at	0.74	155.40

b) Summer:

		Marks
50 kg. clover at 1.20 M. per quintal	0.60 M.	
2.5 kg. straw at 3.2 » »	0.08 »	
155 days at	0.68 »	105.40

2. *Concentrated food.*

for 66 cows	q.	Marks
Wheat bran	106.70	1 152
Crushed Russian barley .	71.90	863
Pea-nut meal	85.20	1 482
Brewer's grains	53.15	584
Dried sugar beet slices. .	117.00	1 146
Dried potato flakes . . .	15.30	250
Best linseed meal	43.75	682
Sesame meal	—	—
Palmnut meal	5.30	60
Maizena.	—	—
Cottonseed meal	23.80	424
	522.10	6 643
per head . . .		10380

1911

1. *Bulky food.*

a) Spring:

		Marks
140 days at 0.74 M.		103.60

b) Summer:

		Marks
40 kg. clover at 1.6 M per q. .	0.64 M.	
3 kg. straw at 4 M » » . .	0.12 »	
155 days at	0.76 »	117.80

c) Autumn:

		Marks
4 kg. hay at 8 M. per q. . . .	0.32 M.	
Distillers wash	0.16 »	
8 kg. beets at 3 M. per q. . . .	0.24 »	
5 kg. straw at 5 M. per q. . . .	0.25 »	
70 days at	0.97 »	67.90

2. *Concentrated food.*

for 58 cows	q.	Marks
Wheat bran	150.30	1 713
Crushed Russian barley .	71.20	954
Pea-nut meal	143.50	2 510
Brewer's grains	6.60	68
Dried sugar beet slices .	41.00	369
Dried potato flakes . . .	—	—
Best linseed meal	60.50	1 028
Sesame meal	20.55	287
Palmnut meal.	105.15	1 334
Maizena.	10.70	162
Cottonseed meal	—	—
	609.50	8 425
per head . . .		145.26

3 *Attendance, etc.*

Straw for litter, 15 quintals at 2.80 M.		42.00
Wages, allowances, milk prizes		45.00
Rent of stable: 4% on 500 M.		20.00
Interest on capital expended on cows		20.00
Losses (cows)	2 230 M.	
Losses (calves)	360 »	
Veterinary	180 »	
	2 770	
for 66 cows, per head		41.97

4. *Cost of milk.*

Upkeep of utensils		5.00
Wages and expenses per week:		
Horse	42.00 M.	
Milk-maid:		
Wages	7.50 M.	
Lodging, firing	1.50 »	
Board	6.00 »	
	52×57.00	
= 2 964 M. for 66 cows, *i. e.* per head		44.91
Total		554.45
Less value of manure		90.00
Expense per head		464.45
Gross returns		478.00
Gain per head		13.55

3. *Attendance, etc.*

Straw for litter, 15 quintals at 2.80 M.		42.00
Wages, allowances, milk prizes		46.00
Rent of stable: 4% on 500 M.		20.00
Interest on capital expended		20.00
Losses (cows)	1 910 M.	
Losses (calves)	240 »	
Veterinary	120 »	
	2 270	
for 64 cows, per head		35.47

4. *Cost of milk.*

Upkeep of utensils		5.00
Wages and expenses per week:		
Horse	42 00 M.	
Milk-maid:		
Wages	7.50 M.	
Lodging, firing	1.50 »	
Board	6.00 »	
	52× 57.00	
= 2 964 M. — for 66 cows *i. e.* per head		46.31
Total		579.38
Less value of manure		90.00
Expense per head		489.38
Gross returns		516.39
Gain per head		27.01

3. *Attendance, etc.*

7.5 q. at 2.80 M. 5 q. at 4.80 M.		45.00
Wages, allowances, milk prizes		47.50
Rent of stable: 4% on 500 M.		20.00
Interest on capital expended		20.00
Losses (cows)	1 580 M.	
Losses (calves)	200 »	
Veterinary	120 »	
	1 900	
For 58 cows, per head		32.76

4. *Cost of milk.*

Upkeep of utensils		5.00
Wages and board per week:		
Horse	42.00 M.	
Wages	8.50 »	
Lodging, firing	1.50 »	
Board	6.00 »	
	52×58.00	
= 3 016 Marks, for 58 cows *i. e.* per head		52.00
Total		656.82
Less value of manure		90.00
Expense per head		566.82
Gross returns		580.56
Gain per head		13.74

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1 kilogram (kg) = 2.2 lbs. — 1 quintal (q) = 220 lbs. — 1 Mark = 11 3/4 *d.*

983 – **The Adaptation of Sheep Farming to Modern Agricultural Methods.** — BORNEMANN in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 43, pp. 397-399. Berlin, May 28, 1913.

The writer points out that extensive sheep-farming for wool is at variance with the modern intensive use of arable land, while intensive breeding of double purpose sheep with fat lamb rearing suits this practice very well and pays even on dear land. He gives as the results to be aimed at: early maturity, fairly homogeneous wool, fertility and deep milking. These are to be obtained by strict selection, and the crossing of German native breeds with English mutton breeds, a second lambing season, and good regular grazing.

984 – **The Cost of Keeping a Heifer up to its first Calving.** — 1. STAKEMANN in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 49, p. 593. Berlin, June 18, 1913. — 2. STABILINI, CARLO in *Giornale di Agricoltura della Domenica*, Year 23, No. 25, p. 195. Piacenza, June 22, 1913.

The writers calculate the cost of keeping a heifer up to the time it drops its first calf as follows:

1) *Stakemann*:	£	s	d	£	s	d
Value of calf	1	10	0			
45 days whole milk, 5 ½ quarts per day	1	6	6			
20 » » » 3 ½ » » »		7	9			
20 » skimmed milk 3½ » » »		1	6			
60 » » » 5 ½ » » »		7	0			
50 » 1 lb. oats; ½ lb. linseed; ½ lb. hay		9	3			
250 » 3 ½ lbs. hay; 5 ½ lbs. oat straw; 2 ¼ lbs. concentrated foods	3	17	3			
100 » 3 ½ lbs. mangolds at 12s per ton,		1	9			
Cost during first year				8	0	0
200 » 5 ½ lbs. hay; 8 3/4 lbs. straw; 2 ¼ lbs. concentrateds	4	4	3			
165 » grazing	1	19	3			
Service		2	0			
Cost during second year				6	6	6
Keep during 9 months gestation	4	8	3			
Cost during third year				4	8	3
For attendance, stabling, etc., for 3 years	1	14	6			
Risk of disease, 5 per cent. for 2 years.		14	9			
General expenses				2	9	3
Total cost at calving				21	4	0

The writer observes that in herds where the breeding is very carefully attended to the cost may be somewhat higher than the above, while where less care is bestowed it may be somewhat less.

2) *Stabilini :*	£	*s*	*d*
Value of calf weighing 88 lbs. at £2 0*s* 4*d* per cwt.	1	12	0
213½ gallons of milk at 6.94*d* per gal.	6	3	9
8 3/4 cwt. hay at 2*s* 9*d* per cwt.	1	4	0
9½ cwt. litter at 1*s* 8*d* »		15	3
14 3/4 cwt. green food at 4 3/4 *d* per cwt.		6	0
Attendance and risk		12	6
Cost during first year	10	13	6
Cost of keep during the succeeding two years	9	2	6
Cost of cow at the age of three years	19	16	0

985 - **The Cost of Production of Wheat.** — LAURENT, FELIX in *Société Centrale d'Agriculture du Département de la Seine-Inferieure,* Year 153, New Series, No. 21, pp. 118-125. Rouen, 1913.

The writer calculates the cost of production of wheat for the three different degrees of intensity of farming as follows :

	Extensive culture, per acre			Medium culture, per acre			Intensive culture, per acre		
	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
Rent		19	3	1	5	9	1	12	2
Taxes		3	10		4	10		5	9
Interest on working capital		8	0		12	10		16	1
Preparation of the soil before sowing		19	3	1	0	10	1	2	6
Farmyard manure	1	12	2	1	15	4	1	18	7
Artificials		—	—		9	8		19	3
Seed		16	1		17	8		19	3
Spreading artificials and sowing		2	7		4	10		6	5
Working the soil after sowing		1	7		3	3		4	10
Cutting and binding		9	8		11	3		12	10
Stooking and carrying		6	5		8	0		6	5
Threshing and cleaning		16	1		17	8		12	10
Delivery		2	3		3	3		3	10
General expenses		9	8		16	1	1	4	0
Total expenses £	7	6	10	9	11	3	11	4	9
Average crop of straw (cwt. of 112 lbs.)	22.3 cwt.			27.9 cwt.			31.9 cwt.		
Value of straw to be deducted £	1	7	0	1	13	9	1	18	7
Cost of production of wheat (grain) £	5	19	10	7	17	6	9	6	2
Average crop of wheat (bushels of 60 lbs.)	21 bu.			30 bu.			37 bu.		
Cost per quarter of wheat	45*s* 10*d*			42*s* 2*d*			40*s* 0*d*		

The writer justifies the reliability of the prices given to the several items in the different degrees of intensity of cultivation and draws the following conclusions from the results. Prices of wheat of about 45*s* per qr. are, in good years, remunerative for the active farmer; but as in calculating the average cost of production only average values may be taken, so must average prices be taken in calculating the profit; the average price of wheat on the Paris Exchange in the years 1902-1911 was 40*s* 8*d* per quarter.

Intensive farming is in the production of wheat much more advantageous than extensive farming. Through the continuously increasing yield per unit of area due to the improved methods of cultivation the total production of wheat is yearly increasing. This increase of total production is however hindered by the diminution in the acreage under wheat, due to the transformation of arable land into pastures and meadows and to the change of rotation from the three years' to the four years'.

986 – **The Most Favourable Time for the Yearly Closing of Farm Accounts.** — BACKMAYR-HEYDA, L. v in *Monatshefte für Landwirtschaft*, Year 6, pp. 161-173. Vienna, June 1913.

The question as to the most favourable time for closing the yearly accounts of the farm should be examined according to the writer from the following points of view.

1. When is it that the farmer, without neglecting other important matters, can devote his time to book-keeping?
2. What are the objects aimed at by his retrospective accounts?
3. When is it that the farmer has reliable figures concerning the success of his farming which allow of no doubt?
4. How can the yearly balance be made to coincide most favourably with other book-keeping so as to avoid doing the work twice?

The writer then discusses these various points and reaches the following conclusions:

1. In the temperate zone of Central Europe the most favourable time for closing the accounts is the winter, that is to say when vegetation is at a standstill.
2. Through the closing of accounts the farmer can recognise the errors that he has committed in the management of his farm so as to avoid them in future and render his undertaking more profitable. Consequently it will be well to close the accounts after the close of the harvest of the product which has the most decisive effect on the success of the farm.
3. The writer discusses this point at length; he treats of the various phases of the calculation of net returns and lays stress on the great difficulties which attend the valuation of those products which have no sale on the market and of standing crops at different periods of the year. From this point of view the most favourable moment would be that in which the errors in the calculation of net returns due to doubtful valuation of unsaleable produce, of standing crops, etc., would be smallest; this is the case when the local value of these products is at its lowest. But in most farms this moment is not the same for the unsaleable products and for the standing

crops, for just before the harvest the value of the first is at a minimum, while the latter are at their maximum. Considering the increasing difficulties of valuing standing crops the nearer the harvest is, it appears that it would be most advantageous to fix the time of closing the accounts when the stock of unsaleable farm produce is no longer very great and at the same time the value of the standing crops can still be approximately valued by the cost of production.

4. The yearly closing of accounts should also coincide with the drawing up of the estimates for the following year; consequently it should take place at a time when the farmer, on the basis of his stock of produce (wheat, forage and litter) and of the quantities of seeds and manures required by his rotation, can estimate his cash income and outlay. Consequently, and also to avoid doing the work twice, it will be well to close the accounts in winter or at least before the beginning of the spring cultivation.

From these considerations the writer comes to the following conclusions. The yearly closing of accounts cannot be carried out in all farms at the same time, irrespective of their climatic and economic conditions, if a reliable calculation of net returns is desired. In every farm that produces only crops almost exclusively of a nature that allows of their sale in the market, the best time for closing the accounts is shortly after the end of the period during which the chief items are produced and before the beginning of a new period. But also in those farms which produce a greater quantity of products that do not find a ready sale on the markets, it would be well to investigate carefully if there are good grounds for the current opinion, according to which the books ought to be balanced at the end of June, so as to avoid the difficulty of valuing those products which are not easily sold in the market and to have the calculation of the net returns free from all figures due only to estimation.

987 – The Net Returns of Farms connected with the Book-keeping Association at Königsberg in Prussia.

— GÜNGERICH. Die Wirtschaftsstatistik der Landwirtschaftlichen Buchführungs-genossenschaft zu Königsberg in Preussen. — *Georgine*, Year 6, No. 45, pp. 338-339. Königsberg, June 5, 1913.

The results of the book-keeping of the farms affiliated to the Königsberg Book-keeping Association for the period 1904-1912, in their relation to income and outlay of cash and net returns per acre of agriculturally utilized land have been collected by the writer in the table on p. 1288.

The average net returns show a great range from year to year; thus for instance the year 1911-12 shows an increase of 160 per cent above the figures of the net returns for 1907-08, and 75 per cent. above the average of the preceding 7 years. Still further apart are the returns of the various farms. From this it may be seen how important it is to estimate the profitableness of a farm and its value according to returns only after a long period of book-keeping.

If the net returns of the last year, 1911-12, be grouped according to the extent of the farms, it will be seen from the following that the net revenue increases inversely with the extent.

Year	Number of farms	Net returns per acre		Receipts per acre		From stock keeping per acre		Sale of produce per acre		Sundries per acre		Expenses per acre		Purchase of live stock per acre		Manures per acre		Foodstuffs per acre		Salaries and wages per acre		Upkeep of buildings and implements, p. acre		Sundries per acre		Wages in kind (wheat)	
		s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d	s	d
1904-05	18	18	6	54	4¼	29	9	21	5	3	2	37	3½	9	1½	2	4½	3	11¾	11	10¾	3	11¾	5	11½	2	11¾
1905-06	45	16	9	68	3	39	1	17	5½	12	8½	50	9¼	13	6	3	2	5	2	11	10¾	3	11¾	13	1	3	6¾
1906-07	57	19	4¾	79	9	44	5¼	23	5	11	10¾	59	1½	17	0¾	3	6¾	6	4¼	13	6	5	2	13	6	3	11¾
1907-08	70	11	4¼	63	5¾	38	5¾	15	10½	9	1½	54	9	11	10¾	3	2	6	9	15	5¾	4	9	12	8½	4	9
1908-09	74	13	11¾	67	10	38	5¾	18	7¾	10	8½	55	11¼	11	10¾	3	11¾	7	1¾	15	10	4	9	12	3½	5	2
1909-10	89	19	3¼	75	9¼	42	10¼	25	4¾	7	6½	57	1½	12	8½	4	4¼	7	6½	16	3¼	4	9	11	6	4	9
1910-11	96	15	9	73	9½	46	9¾	19	10	7	1¾	59	11	13	1	4	9	8	4	16	8	5	2	11	10¾	4	9
1911-12	118	28	9½	90	10¼	48	4¾	34	11	7	6½	64	3¼	13	6	6	9	9	6¼	17	0¾	5	11½	11	6	5	4¼
Average . . .		17	11¾	71	9¾	40	10½	22	2¾	8	8¾	54	9	12	10¾	3	11¾	6	9	14	10½	4	9	11	6	4	4¼

Number of farms	Extent: acres	Net returns per acre
22	up to 618	£ 1 11 *s* 1 ¼ *d*
49	618 to 1236	£ 1 10 *s* 0 ¾ *d*
27	1236 to 1854	£ 1 7 *s* 3 ½ *d*
14	above 1854	£ 1 2 *s* 7 ¼ *d*

The average net returns give, on capitalizing at the rate of 4 per cent., an average capital value of 17*s* 10 ¼ *d* × 25 = £ 22 6*s* 4*d* per acre, a price which has already been considerably exceeded by recent prices of property.

The income and outlay of cash has increased yearly; the total outlay in the year 1911-12 exceeds that of 1905-06 by 30 per cent. This increase is chiefly due to the higher wages and to the increased use of chemicals. The wages in cash per acre of cultivated land have increased by 30 per cent., and together with the wages in kind (wheat), by 50 per cent. The outlay on manures has risen by 180 per cent. and on foodstuffs by 140 per cent.

This increase of intensity that becomes visible in the increased figures of the cash account has a very satisfactory economic result in the considerably increased production of live stock and of wheat; but the result to private economy is not so satisfactory, because the net returns of the farm have not increased at the same rate as the intensity of farming. The cause of this inequality between the increase of intensity and that of the net returns, in spite of the fact that the prices of the means of production, such as foodstuffs, manures, farm machines and implements, have remained stationary or have even sunk, while the prices of live stock and its produce as well as wheat have considerably risen of late years, are attributed by the writer to the great rise in the prices of landed property and to the fact that the capacity of the managers of farms is not yet on a level with the great demands of intensive farming.

988 - **Italian Emigration in 1912.** — *L'Agricoltura italiana*, Year 9, Series 4, Part 10, pp. 297-299. Pisa, May 31, 1913.

The total number of emigrants from all parts of Italy was larger in 1912 than in 1911, the greatest increase in numbers in proportion to population being from the Marches, Calabria, Sicily, the Abruzzi, Basilicata and Latium. As in former years, the emigrants from Northern Italy mostly spread into other European countries, while those from the south chiefly sought their fortunes beyond the seas. Most of the emigrants consist of agricultural labourers, shepherds, day labourers, masons, iron works men and other industrial workers. The better educated classes were poorly represented.

In 1912, 308 140 passports were made out for European countries as against 271 065 in 1911; the surplus, numbering 30 405 individuals, went chiefly to France, Germany and Austria-Hungary. The number of emigrants to North and South America was 399 713 in 1912, as against 260 372 in 1911. In both years the largest numbers went to the United States, the numbers rising from 191 087 to 267 637. The number of emigrants to Canada rose from 9094 to 18 991, of those to Argentina from 32 719 to 72 154, of those to Brazil from 22 287 to 35 562, to Chile, Peru and Bolivia from 1061 to 1530, and to Central America from 1116 to 1438. On the other hand, the number of emigrants to Mexico fell from 1020 to 758, and that of emigrants to Uruguay and Paraguay from 1988 to 1643. Owing to the annexation of Libya, the emigrants to Africa increased by 8332, while 82 and 394 fewer went to Asia and Oceania respectively.

The numbers of emigrants coming from the different districts of Italy in 1912 were as follows:

District —	Emigrants to European countries —	Over sea emigrants —	Total —
Piedmont	38 556	26 688	65 244
Liguria	3 043	5 823	8 866
Lombardy	59 059	16 377	75 436
Venetia	96 842	17 275	114 117
Emilia	27 153	8 616	35 769
Tuscany	27 484	13 455	40 939
Marches	14 072	18 355	32 427
Umbria	11 063	2 978	14 041
Latium	2 688	15 185	17 873
Abruzzi	6 123	40 379	46 502
Campania	5 491	61 448	66 939
Apulia	4 344	28 845	33 189
Basilicata	546	14 322	14 868
Calabria	1 290	46 033	47 323
Sicily	5 514	87 274	92 788
Sardinia	4 872	4 259	9 131
Total	308 140	407 312	715 452

With a total population of 34 813 975 in 1912, there were 2044 emigrants for every 100 000 persons in Italy, as against 1539 in the preceding year.

The emigration to Tripoli rose from 1032 persons in 1911 to 7428 in 1912, *viz.* an increase of 6396.

989 – **The Strikes of Agricultural Labourers in Italy in 1911.** — *L'Agricoltura italiana*, Year 9, Series 4, Part 10, p. 311. Pisa, May 31, 1913.

The number of agricultural strikes and of strikers in the different Regions of Italy in 1911 were as follows.

Districts	Strikes	Strikers
Piedmont	12	4 134
Lombardy	42	3 029
Venetia	13	2 281
Emilia	57	104 771
Tuscany	2	282
Marches	1	?
Umbria	5	2 873
Latium	6	1 190
Campania	1	47
Apulia	3	1 000
Sicily	6	3 131
Total	148	132 738

In those districts where there were fewest strikes the share system is general, *viz.*, in Campania, the Marches, Tuscany and Latium, while it is comparatively rare in the districts where most strikes occurred: Emilia, Lombardy, Piedmont, etc.

990 - **Ways and Means of Indian Agricultural Development.** — DOBBS, A. C. in *The Agricultural Journal of India*, Vol. 8, Part 2, pp. 161-168. Calcutta, April 1913.

The writer is of opinion that the most effectual method of improving agriculture in East India is by substituting for the labour of men and animals the less costly and more efficient assistance afforded by agricultural machines. He hopes, therefore, that the Agricultural Department, which has hitherto been occupied in standardising seeds and popularising the best existing methods of cultivation, will now turn its attention to importing and popularizing agricultural machines, especially steam ploughs and traction engines. In sugar cane districts, the introduction of the steam plough promises excellent results, as the areas under this crop are extensive and the soil requires deep cultivation. An obstacle to mechanical cultivation in many districts is the prevalence of small holdings ; here its introduction will have to be left to the operation of economic forces, assisted perhaps by the spread of the co-operative idea. The larger amount of energy available will doubtless be used in elaborating agricultural and forest products.

AGRICULTURAL INDUSTRIES.

991 - **Buffalo Milk Analysis** (1). — PAPPEL, A. in *The Cairo Scientific Journal*, Vol. VII, No. 78, pp. 63-67. Alexandria, March 1913. DAIRYING

In a communication on the composition and analysis of milk and butter Mr. Lucas pointed out that the interpretation of the analytical results is often difficult owing to the absence of standards based on a sufficient number of analyses of samples known to be absolutely pure.

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(1) See No. 1653, *B.* Dec. 1912. (*Ed.*).

Being convinced of the necessity of establishing these standards, the writer gives the results of a certain number of his analyses of buffalo milk.

The samples of milk were taken from cows which were examined each time by a veterinary surgeon in order to make sure that the milk analysed was that of healthy and well fed animals and might be considered normal.

Each sample comes from several animals, usually six, and thus represents a normal average milk. The writer hopes it will be possible to have 8 to 10 samples examined in this way each month for at least one year, and if other laboratories would join in this work he thinks it would be advantageous to use the same method everywhere and to express the results in an identical way, so that they can be readily compared. He therefore submits the results of a few analyses together with the method employed.

Specific Gravity.

Maximum	1.0346
Minimum	1.0315
Mean for the 14 samples:	1.0333

The specific gravity was determined at 15° C., Sprengel's pyknometer being used.

Total solids.

Maximum	18.71
Minimum	16.56
Mean for the 14 samples:	17.69

The results are given always on 100 grams. The writer describes the three methods he used and which gave results differing only in the second place of decimals.

Fat.

Maximum	8.61
Minimum	6.79
Mean for the 14 samples:	7.74

Adam's method was employed, using petroleum ether freshly distilled between 45° and 55° instead of ordinary ether.

For routine work Gerber's method can be employed, but as in buffalo's milk the amount of fat is very high, it must be decided at what temperature the volume of fat shall be read. From the analyses made, the writer observed that the reading at 60° agrees better with Adam's method than the reading at 70°.

Lactose.

Maximum	5.05
Minimum	4.70

Mean of the 14 samples: 4.89 per cent (calculated as anhydride).

The gravimetric method was used, the lactose being determined with Fehling's solution, using Soxhlet's modification.

The lactose was also determined with the polarimeter, but this method presents some drawbacks.

Proteins.

The nitrogen was determined by Kjeldahl's method.

Maximum	0.698
Minimum	0.587
Mean for the 14 samples	0.642

But the factor to be used to convert nitrogen into protein is open to discussion, as enough experiments have not been made to know whether the usual factor 6.3 is correct for buffalo's milk. Using this factor the proteins equal 3.70 to 4.37, and the mean for the 14 samples is 4.04. The writer hopes before long to be able to solve the question satisfactorily.

Ash.

The figures are obtained by calcination at the lowest possible temperature of 10 c.c. of milk.

Maximum	0.84
Minimum	0.70
Mean for the 14 sampless.	0.78

In the ash the alkalinity and the chlorine have been determined. The figures obtained are:

1) Chlorine calculated as sodium chloride.

Maximum	0.099
Minimum	0.070
Mean for the 14 samples:	0.078

2) The alkalinity is given in cubic centimetres of normal sulphuric acid:

Maximum	9.2 %
Minimum	7.6 »
Mean for the 14 samples:	8.4 »

Total Solids Not Fat.

This figure is always used in milk analysis, as differences are chiefly observed in the amount of fat. For the other constituents the differences are not great and therefore the total solids not fat is a nearly constant figure.

Maximum	10.23
Minimum	9.43
Mean for the 14 samples:	9.87

Very often in routine work only the specific gravity and the fat are determined and the total solids not fat are calculated using Fleischmann's formula. But for buffalo's milk the figures obtained with Fleischmann's formula are too high. In studying the figures obtained in the present analyses the writer found a formula which in all the 14 cases has given a nearer result than Fleischmann's formula, and the application of this new formula is much easier, as no tables are necessary.

The following is a practical example. Supposing a milk has given:

Specific gravity:	1.0328
Fat	8.6 per cent.

The total solids not fat equal:

$$\frac{32.8}{4} + \frac{8.6}{5} = 9.92 \text{ per cent.}$$

The application of this formula for the 14 samples has given:

Maximum	10.11
Minimum	9.50
Mean for the 14 samples:	9.87

that is to say the same figure as the writer obtained directly.

992 - **The Determination of Fat in Dried Milk.** — RUSCHE in *Molkerei-Zeitung*, Year 27, No 50, pp. 977-978. Hildesheim, July 2, 1913.

The writer recommends for the determination of the fat contained in dry milk the following rapid method, devised at the Berlin Dairy Experiment Station (Versuchsstation und Lehranstalt für Molkereiwesen). Ten cubic centimetres of sulphuric acid (S. G. 1.82), 5 c.c. of water and 1 c.c. of amyl alcohol are carefully poured in layers over each other in a usual Gerber's butyrometer. To this 1.133 gram of milk powder, weighed in a specially divised weighing funnel with rubber stopper, and 5 c.c. of water are added.

After vigorous shaking the butyrometer is left in a water bath at 65 to 70° C. (shaking it from time to time) until the liquid has become clear; then it is centrifugated for 15 minutes. The sample is again put into a water bath at 65° C.; the fat content is read off and multiplied by 10. To make sure that the fat has been completely separated it is well to centrifugate the sample again for 5 minutes after having read off the fat content.

This method has the advantage of being rapid and easy to carry out, it gives a clear separation of the fat and can be used for the most various kinds of dried milk. In order, however, to obtain exact results the process as indicated by the writer must be strictly followed.

993 - **A Comparison of the Acid Test and the Rennet Test for Determining the Condition of Milk for the Cheddar Type of Cheese.** — HASTINGS, E. G. and EVANS, ALICE C. - *U. S. Department of Agriculture, Bureau of Animal Industry, Circular 210*, p. 6. Washington, April 1913.

In the making of the Cheddar type of cheese it is desirable that the condition of the milk be such that the whey can be drawn from the curd at the expiration of approximately the same time each day. To control this the cheese-maker must be able to ripen the milk to approximately the same point each day. Two tests are employed to determine the ripeness of the milk, the rennet test in one or other of its modifications, and the acid test or the titration of the milk.

From the work effected by the writers, it is evident that, for the purpose of determining the ripeness of milk for cheese making, the rennet test is superior to the acid test.

BREWING AND DISTILLING

994. - **Use of Prickly Pears for Alcohol Production.** - CETTOLINI, SANTE in *Società degli agricoltori italiani, Bollettino quindicinale,* Year XVIII, No. 12, pp. 456-459. Rome, June 30, 1913.

The writer recalls the experimental results obtained some years ago by Dr. Sanna and by Colladel, œnologist at the Œnological School at Cagliari, in their attempt to distil prickly pears (*Opuntia*) which grow in Sardinia without any cultivation. The fruit was small but heavy, averaging 3.6 oz. each, owing to the large number of seeds and the consistency of the pulp. When peeled, crushed, and submitted to pressure, 432 lbs. yielded 26.8 galls. of somewhat viscous juice having a density of 1.0548. Skins represented 37.64 per cent. of the weight and the seeds 4.2 per cent., leaving a little under 59 per cent. for the material to be used for alcohol extraction. The analysis yielded the following results.

Whole fruit:	albuminous substances	6.75 %
	oily »	0.2758
	cellulose »	1.342
Juice:	extractable material	15.54 %
	acidity.	0.0102 »
	ash	0.692 »
	saccharine substances	11.20 »

It was remarked that the saccharine substances were essentially aldehydic in character and present in sufficient quantity to be distilled economically, whereas the acidity was insufficient.

After a series of trials, the best results were obtained by squashing the unpeeled fruits and putting the pulp thus obtained into bags and subjecting it to high pressure. The lack of acidity was then corrected by the addition of 0.32 oz. of tartaric acid per gallon and the liquid inoculated with a good alcoholic ferment in very active condition. The fermented liquid contained 5.98 per cent. of alcohol, showing that the saccharine material was well utilized. By distillation and subsequent rectification a spirit was obtained with a pleasant etherial perfume which would make it unsuitable for various industrial purposes. The press cake could be used as stock food. It may be estimated roughly that 100 lbs. of figs will produce 0.6 gal. of alcohol, and taking 120 cwt. of fruit as an average yield per acre, 80 gals of alcohol may be obtained per acre.

PLANT DISEASES

GENERAL INFORMATION

LEGISLATIVE AND ADMINISTRATIVE MEASURES

995 - **Measures for the Prevention and Control of Plant Diseases in Italy.** — *Atti Parlamentari, Camera dei Deputati* (No. 1430-1430 A), *Senato del Regno* (No. 1142-1142 A), 1913.

The Chamber of Deputies and the Senate have approved in the respective sittings of June 14 and 22, 1913 the following law:

Art. 1 — The owners and managers of horticultural establishments and nurseries, who produce or trade in plants, parts of plants, and seeds must notify themselves to the prefect of the province.

The Ministry of Agriculture, Industry and Commerce has the right to cause an inspection to be made of the cultivations and of the produce wherever they be kept, and to prohibit their sale if they should be found to be infected, or to order the necessary disinfection.

Art. 2. — The Ministry of Agriculture, Industry and Commerce may, by means of a ministerial decree:

a) suspend the importation into the Kingdom and the transit through it of plants or plant products if these be found to be infected;

b) determine the ports and the frontier stations through which only is the importation from abroad of living plants, seeds and other plant products allowed;

c) prevent the exportation of plants, parts of plants and seeds from the territory of communes in which the existence of infectious diseases has been ascertained.

Art. 3. — The delegates of the Ministry entrusted with the surveillance of the ports and frontier stations have the right to:

a) enforce the disinfection of plants, parts of plant and seeds which they may consider infected, as well as of the packing cases and any other object which may be a vehicle of disease germs;

b) prohibit the importation into the Kingdom, and transit through it, of plants which they consider infected or bearing germs of disease.

No indemnity is due for the disinfections or the prohibitions mentioned in this article.

Art. 4. — No indemity is due for the trees, plantations, seeds or other plant products which might be injured or destroyed by the operations carried out with the object of providing, according to the provisions of the following article 5, for the protection of cultivated plants against disease.

Nevertheless the Ministry may give special subsidies according to the provisions contained in the Regulations, when the destruction of plants, etc., is carried out in the farms of small peasant proprietors, or small farmers who work with their own hands the said farms.

Art. 5. — The delegates of the Ministry of Agriculture, Industry and Commerce have the right to enter into all farms, whatever be the crop or its destination, in order to ascertain the existence of plant diseases and to carry out, as set forth by the present Law and by the special Regulations, the disinfection and cure of the infected plants.

The Ministry of Agriculture, Industry and Commerce, having heard the Commission for the protection of plants against disease, nominated by the Royal Decree of October 25, 1911 (No. 1208) may render compulsory the use of remedies against the diseases of plants and the use of means of control against insect and other plant pests, in cases in which the efficiency of these means depends upon the united action of all those interested in such crops; it may further cause those treatments and destructions which it considers necessary to be carried out at the expense of those who fail or delay in carrying them out themselves.

6. — The owners of lands in which infectious diseases exist may unite in communal, intercommunal and provincial associations (consorzi).

The formation of these associations must be promoted by the executive committee (giunta) of the communal or provincial council according to whether the association be communal, intercommunal, or provincial, when it is demanded by a number of landowners who represent at least one half of the cultivated acreage for which protection is demanded. The request has to be presented to the syndic in the case of communal associations, and to the president of the provincial council in the other cases.

The constitution of these associations may be rendered obligatory by the prefect after having heard the executive committee or committees of the communes or of the provincial council, according as to whether a communal, intercommunal or provincial association be contemplated, and when the lack of such an association constitutes a disadvantage or a danger to the protection of the interests of the agriculture of the district.

The regulation to be issued for the application of the present law will set forth the rules to be followed for the constitution, administration and working of the associations.

The associations will be empowered to levy, in such a manner as shall be stated in the Regulations, a yearly contribution not exceeding 1*s* 7*d* per acre on those landowners of the district who are concerned.

The provisions of the law for the collection of direct taxes, including the fiscal privileges, shall be applied to the formation of the rolls of contributors and to the collection of their contributions.

The benefits arising from the present laws on the antiphylloxera associations (consorzi antifilosserici) may be extended to the associations of vine growers formed according to this law.

The antiphylloxera associations constituted according to the laws at present in force may act also for the diseases of other cultivated plants in their respective territories.

The powers considered in this article may in cases of urgency be extended also by a decree of the prefect, after haviwg heard the bodies mentioned in the third paragraph, to associations of landowners which are already regularly formed.

Art. 7. — The State may take steps, at its own expense, for the direction of the work of protection against plant diseases, insects, and other plant pests, whenever it should deem it necessary, considering the nature and importance of the injury. It may also contribute up to one half the amount of the expenses of carrying out the necessary control.

The other half shall be defrayed by the parties concerned, but it may be advanced by the State, against reimbursement in one or more years by means of transfers to the collectors of taxes and of association dues or in such other ways as may be ordered by the regulation.

Art. 8. — Contraveners of the provisions of the present law and of the Regulations which will be issued in conformity with it, shall be liable to fines ranging between 8*s* and £7 18 *s* 6 *d*, without prejudice to further penalties which may be incurred for contraventions of the penal code.

Contraveners of the prohibitions of importation and transit shall be fined not less than 8 *s* nor more than £11 17 *s* 10 *d*, without prejudice to further penalties which may be inflicted in accordance with the customs law on smuggling.

For the determination and definition of such contraventions, the provisions at present in force in the matter of customs are applicable.

Art. 9. — The funds voted in the budget of the Ministry of Agriculture, Industry and Commerce in chap. 40 of the year 1912-13 will be raised, in the same chapter of the year 1913-14 and in succeeding years, to £5470, in order to meet the outlay consequent upon the enforcement of the present lawand the engagement of the staff according to Table B (1).

From the year 1913-14 the sum voted in chap. 71 of the budget of 1912-13 will be increased by £475 in order to meet the outlay according to Table A (2).

Art. 10. — The special laws on *Diaspis pentagona* of March 24, 1904, No. 130, and on *Doriphora* of May 30, 1875, No. 2517 (2nd series), are abrogated.

Art. 11. — The Regulation to be issued for the application of the present law will contain provisions for the organization of the services of surveillance and warning, and of the prevention and cure of diseases, and for the reimbursement of the sums advanced by the State on behalf of the persons concerned.

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(1) Roll of the inspectors of plant diseases. (*Ed.*).

(2) Roll of the employees of the Royal Station of Agricultural Entomology at Florence. (*Ed.*).

996 – Order in Council on the Introduction of Potatoes into Western Australia.

Extract from *Government Gazette* of 19th April, 1913.

Whereas by "The Insect Pests Amendment Act, 1898," the Governor by order in Council may from time to time make such regulations as he deems necessary for any purpose for which regulations are contemplated by the said Act, or which he deems necessary for giving full effect to the said Act: Now, therefore, His Excellency the Governor, by and with the advice and consent of the Executive Council, doth hereby revoke the regulations made under the said Act, and published in the *Government Gazette* on the 17th day of November 1911, and doth hereby make the regulations set forth in the Schedule hereto, and doth hereby declare that the said regulations shall come into force on the publication of this Order in the *Government Gazette.*

REGULATIONS.

1. All potatoes imported pursuant to the exception contained in the Proclamation made under "The Insect Pests Amendment Act, 1898", and published in the *Government Gazette* on the 19th day of April 1912, must be in new and sound bags branded with the name and address of the grower and the letter "P" not less than six inches long, and must be accompanied by a Government Certificate signed by an officer of the Department of Agriculture of the State from which the potatoes are imported, certifying that such potatoes are sound and were grown on a farm which has been free from Irish Blight for 12 months then last past.

2. All imported potatoes shall be subject to inspection at the port of entry by an inspector under the said Act.

3. The potatoes on arrival at the port of entry shall, at the expense of the importer, be delivered direct into a shed set apart by the Department of Agriculture, for inspection and such other treatment as may be decided upon from time to time by the Inspector or other officer of the Department.

4. The importer or his agent shall, at the importers's expense, provide the necessary labour to open the bags and to re-bag the potatoes, if passed on inspection, and in every way facilitate the inspection.

5. If the Inspector declares any imported potatoes to be diseased, or infected with disease, the importer shall, at the request of the Inspector and at his own expense, disinfect, destroy, or otherwise dispose of such potatoes as the Inspector may direct.

6. Any consignment of potatoes being or having been in contact with any diseased or prohibited consignment of potatoes may be destroyed, disinfected, or otherwise dealt with at the expense of the importer as the Inspector may direct.

7. A fee of One shilling for every bag of imported potatoes shall be charged to defray the cost of inspection and of carrying these Regulations into effect.

8. Imported second-hand potato bags shall be disinfected at the port of entry as follows, namely: By dipping the said bags and keeping them continually submerged for not less than fifteen minutes in a solution of not less than one pound of bluestone to every ten gallons of water.

9. All bags or packages that have contained imported potatoes may be disinfected or destroyed or otherwise disposed of by the Inspector.

10. If any importer or his agent fails or neglects to observe these Regulations, or to carry out the requirements of any Inspector as aforesaid, the Inspector may destroy the potatoes or perform the work at the expense in all things of the importer.

997 - **Outline of Administration in Controlling Insects and Fungi Injurious to Agricultural Plants in Japan.** 32 pp., 1 fig. Tokio, 1913.

The first chapter of this publication of the Bureau of Agriculture, Department of Agriculture and Commerce, of Tokyo sets forth the nature of the task undertaken by the administration of the state in the control of insects and fungi injurious to agriculture. The necessary measurs are carried out partly by the Imperial Government, and partly by the local governments. A list is given of the legislative measures and instructions emanating from the above-mentioned authorities.

The second chapter deals briefly with the entomological and pathological work pertaining to injurious insects and plant diseases which is carried out at the Agricultural Experiment Stations.

In the third chapter, are set forth the measures, adopted by Public Communities (self-governing organs from the prefecture to the village) and other Public Bodies, for the control of plant diseases and the special regulations respecting the export of rice, fruits, and plants. The fourth chapter speaks of the instruction in phytopathology given in the governmental, communal or private agricultural schools, and in the institutes of various grades, and mentions the practical results of researches in this direction,

The fifth chapter continues the enumeration of the most important animal and plant parasites and gives the methods of their control.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

998 - **An Undetermined Pear Disease.** — PASSY, PIERRE in *Revue Horticole*, Year 85, No. 11, pp. 252-253. Paris, June 1, 1913.

Towards the middle of the summer, the sheath of buds in course of development loses its smooth, almost varnished appearance, and becomes dull; at the same time it takes a purple hue, and subsequently the epidermis becomes slightly warted. If the attack is slight, no further consequences ensue. The following year, the branches again show signs of the disease, the epidermis is purple and wrinkled. If lateral fruits occur they exhibit, shortly after the fall of the flowers, superficial scars covered with a somewhat wrinkled, suberous skin.

But the disease can assume a more serious character. From the first year, the attack can be more severe; and after the above changes have become very apparent the leaves of the buds cease developing and the lengthening of the bud axis is suddenly arrested, the dying off beginning at the top of the bud. The older branches which had not suffered much at first, become perforated and cracked; their appearance presents some analogy to that of victims of "tavelure", but in this case the cracks are usually longitudinal. Further, this cracking of the branches can be more marked, penetrate deeply and sometimes cause the death of old branches. Trees thus attacked grow very little, and if any fruits survive, they are much perforated and cracked; as a rule, they cannot develop, but turn black and are quite useless.

If, in the hope of saving a diseased tree, it be closely pruned, and all the visibly affected portions are removed, the buds which subsequenly develop are attacked in their turn, and infected trees seldom, or never, recover.

The writer has observed this disease for more than 15 years, though it has never before been recorded. The cases were at first isolated, but are now increasing: one row of 20 espalier "Doyenne du Comice" trees planted two years ago has been completely attacked. In spite of the researches which have been made to determine the cause of this disease, the pathogenetic agent is still unknown. The writer, however, thinks that we have here to do with a real parasitic disease, probably due to a bacterium. He bases his opinion upon the progress of the disease, its persistance on the trees infected, the visible modifications of the branches, and the reappearance of the malady after the removal of the diseased branches.

The disease shows itself alike upon trees planted on dry and on damp soil. The writer has observed it not only in the immediate neighbourhood of Paris, but elsewhere, many badly diseased trees being found in a consignment from Normandy.

The writer will continue his researches on the disease.

BACTERIAL AND FUNGOID DISEASES.

MEANS OF PREVENTION AND CONTROL

999 – **Experiments in Spraying Peaches and Vines in 1912** (1). — PANTANELLI, E. in *Le Stazioni sperimentali agrarie Italiane*, Vol. XLVI, Part 5, pp. 329-346. Modena, 1913.

Liquid concentrated polysulphides of calcium and barium kept in hermetically sealed receptacles and diluted just before use, *i. e.* polysulphides as supplied by the trade, have proved in the course of experiments made in Latium in 1912, to be efficacious in the control of

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(1) See also No. 1194, B. July 1912. (*Ed*).

Exoascus deformans, peach leaf-curl, but quite useless in the case of *Plasmopara viticola* which attacks the leaves, flowers, and fruit of the vine. Unlike the polysulphides prepared on the spot and immediately applied, these diluted concentrated polysulphides do not scorch the peach leaves, nor cause them to fall; they did, however, in one case scorch the youngest buds of some vines.

Scott's self-boiled lime-sulphur mixture (1) is efficacious as a spring remedy against *Exoascus deformans*, and was always useful in preventing peaches from being attacked by the rot due to *Monilia cinerea*.

Suspensions of iodide of copper are almost useless against *E. deformans* and cause many of the leaves to fall, but do not produce any visible scorching; suspensions of iodide of silver, on the other hand, are efficacious, and were it not for their prohibitive cost, would be to be recommended on account of the ease with which they are prepared.

Silver soap emulsion (Vermorel and Dantony's formula) was of little use in 1912 in checking vine mildew (*Plasmopara*), while it had the disadvantage of being costly and slow to prepare, as the soap is difficult to dissolve.

The application of a suspension of "cuprosa" powder (the trade name for powdered oxychloride of copper prepared at the Bex factory) and of a wash made with Caffaro's "Pasta ellettrocuprifera" (consisting chiefly of oxychloride of copper, but also containing lime and a considerable amount of water) were equally efficacious in checking vine mildew. The former has the advantage of being more quickly and accurately prepared; the latter, however, costs less than half as much. Both are good remedies against mildew, but give a rather smaller crop of grapes than is obtained with Bordeaux mixtures, as they have little or no stimulating effect upon the growth of the vine.

Comparing the results of 1912 with those obtained previously, the writer comes to the conclusion that Bordeaux mixture is to be preferred among washes containing copper, and cannot be replaced by sulphur mixtures, unless it be polysulphides (especially polysulphides of calcium) prepared on the spot and immediately applied. For this purpose all the more or less concentrated, solid or liquid polysylphides, which now begin to flood the market, are not to be recommended. On the other hand, dilutions of ready-made commercial polysulphides of calcium and barium may be used for the spring treatment of peach trees as a remedy against *Exoascus deformans*.

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(1) See Nos. 1534-1535, *B.* May 1911 and No. 423, *B.* Feb. 1912. (*Ed.*).

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1000 - **Conservation of Vitality in the Seeds of Weeds buried deeply in the Arable Layer of Soil periodically tilled.** — MUNERATI, O. and ZAPPAROLI, T. V. in *Le Stazioni sperimentali italiane*, Vol. XLVI, Part 5, pp. 347-371, 1 fig. Modena, 1913.

The writers, with the object of imitating as much as possible natural conditions, did not use in their experiments the porous pots used by other experimenters (Duvel, Snell, Dorph-Petersen). They placed the seeds at various depths, excavating small square holes and filling them up with the soil from the field, after having placed a cross of iron wire at a short distance above the seeds so as to be able to find them again easily.

The observations made enable the writers to state that, for the seeds of the great majority of cultivated or spontaneous plants, both those with teguments easily permeated by water and those having this quality in a lesser degree, "the power of conserving vitality possessed by seeds buried in the soil is strictly dependent upon the actual germinative faculty or readiness to germinate which they have at the moment when they are buried ".

In other words, and speaking generally :

1) The readier a seed is to sprout at a determined time, the less will it preserve its vitality in the soil, irrespective of the depth at which it be buried. The seeds of most cultivated species that have an immediate germinative faculty, do not remain alive in the soil: to such an extent is this true that if they were left to themselves in the fields such species would soon disappear.

2) The longer the seeds of a given species keep in a condition unfavourable to germination, even under the most favourable conditions of moisture, air and warmth, the longer will these seeds remain alive in the soil, wether they be near the surface or ploughed deeply under.

3) The expression " Seeds that have rapidly lost their faculty of germinating in the soil " does not give a true impression of the facts as they take place in the soil. A seed may lose its germinative faculty out of the soil also and in surroundings in which most important factors for its evolution, namely water, be lacking. On the contrary it should be said, for cultivated and wild plants : " Seeds that sprouted soon in the soil and immediately died, or seeds which lost their vitality before germinating ".

4) The power that the seeds of wild plants have of remaining inactive in the presence of the factor water changes more or less rapidly with time. The seeds with hard teguments gradually lose the faculty of preventing the admission of water, and in other seeds, those conditions which allow water to perform its function of mobilizing matter successively gain ground. The slower a seed is to react to water, either in a granary or at a greater or

less depth in the soil, the more will the species be a pest. As soon as the seed of a wild plant ceases to oppose its primitive resistance to the action of water, its power of conserving its vitality in the soil does not differ from that of the seed of any cultivated plant. This is the reason of the fact that in the cultivated layer, germinating seeds are found at considerable depths and as much as one to two years after when they were buried.

5) In the long run the seeds remaining at a depth and not germinating end by finding in their forced habitat a state of equilibrium which would allow them to preserve their vitality almost indefinitely, but in normal conditions the implements of tillage interfere in time with this equilibrium.

6) The seeds which preserve their germinative faculty in the soil, even if actually in condition to germinate easily, are those which require the action of light also in order to germinate: typical of this kind, among weeds, is charlock (*Sinapis arvensis*).

The lack of one or the other of the three factors, oxygen, moisture and warmth, which are commonly considered as determinants of the process of germination, is not sufficient explanation of the conservation of the vitality of seeds, because a covering of only a few inches of soil has the same protective action as a layer of 14 to 16 inches and upwards. Meanwhile, either the seeds can germinate without light (and this is the case of most weeds of the lower valley of the Po) and then their germination will take place more or less regularly both in the superficial and in the deeper layers of the arable soil; or they require light and then they must remain wholly on the surface of the soil, because even a very slight tilling of the soil would prevent their germinating.

7) In practice, superficial or deep tilling of the soil, even if done frequently, has but a limited effect in the control of those weeds that are multiplied by seeds. If the seeds of weeds are not effectively prevented from ripening and falling to the ground, the control of weeds runs in a vicious circle and remains one of the most serious and difficult problems of intensive agriculture.

INSECT PESTS.

GENERALITIES

1001 – ***Scydmaenus chevalieri*** **n. sp. in Senegal.** — VUILLET, A. Description d'un *Scydmaenus* nouveau du Sénégal (Col. *Scydmaenidae*). — *Bulletin de la Société entomologique de France*, 1913, No. 9, p. 238. Paris, 1913.

The writer describes as new to science and under the name *Scydmaenus chevalieri*, a small beetle discovered at Kaolack (Senegal) by A. Chevalier. The beetle was found in fields of pea-nut (*Arachis hypogaea*), where it appeared to live on the underground fruits of this plant.

MEANS OF PREVENTION AND CONTROL

1002 - **Septicaemia Produced by *Bacillus Melolonthae* and *B. Bombycis* in Cockchafers and Silkworms.** — CHATTON, EDOUARD. Septicémies spontanées à coccobacilles chez le Hanneton et le Ver à Soie. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 22, pp. 1707-1709. Paris, June 2, 1913.

In May 1912, the writer carried out some experiments on the pathogenic action of *Bacillus acridiorum* Herelle (1) on cockchafers; these at once showed signs of being affected by the virus, inoculated by punctures made in the body cavity, and died between 24 and 48 hours after the operation. After having been attenuated by being used successively on ten different subjects without any intermediate culture, the virus, having remained pure, killed its victims in 12 to 24 hours, the average number of surviving females exceeding that of the males. But even the most virulent virus did not kill the cockchafers or even infect them if it only entered the insect by way of the mouth.

At the outset of the experiments, the writer noted the existence of a septicaemia in the cockchafer due to *B. melolonthae*, which, though related to *B acridiorum*, exhibits many points of difference both morphological and cultural, being larger than the latter and showing fluorescence when cultivated for 5-6 days on agar, also having a pathogenic action on silkworms. In fact, while the larvae of the latter enjoy complete immunity from *B. acridiorum*, *B. melolonthae* when injected appears as toxic to them as to cockchafers, though innocuous to both insects when merely ingested.

B. melolonthae, when of spontaneous origin, *i.e* not cultivated artificially, if injected into the body cavity of a cockchafer, kills it within 12 to 36 hours; if made more virulent by repeated cultures the virus destroys the insect always in less than 24 hours. The few cases of infection by ingestion recorded in the experiments have not been tabulated and their percentage is not greater than that of the spontaneous cases, *viz.* a mean of 5 a day. Moreover, 75 per cent. of the healthy cockchafers have *B. melolonthae* present in their digestive tubes, sometimes in dense cultures, and the parasite is invariably present in cockchafers suffering from septicaemia. The infection of the blood seems therefore to originate in the intestines and the parasite which is habitually present in the alimentary tract of the cockchafer, does not pass into the body cavity except under special conditions which are at present unknown. If taken from the intestine and inoculated directly or after culture into the body cavity, it produces septicaemia.

The writer also found another septic bacillus (*B. bombycis*) in the silkworm, which caused a daily mortality of 5 to 10 in a brood of 2000. It has the morphological characters of *B. melolonthae* but does not produce fluorescence in agar; its virulence distinguishes it from *B. acridiorum*. Like *B. melolonthae*, *B. bombycis* kills a silkworm in 12 to 24 hours after inoculation into the body cavity, and the writer was able to get infection by ingestion in the case of 4 individuals out of 27. It seems therefore to be more virulent than the two first-mentioned bacilli. It is, moreover, much less common in the digestive canal of healthy silkworms than is *B. melolonthae* in that of the cockchafer.

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(1) See No. 750, *B.* April 1912. (*Ed.*).

The disease produced by *B. bombycis* does not yet seem to be included amongst those that destroy silkworms. Until the death of the latter, no characteristic external signs of infection are visible. The writer proposes the name of "cocco-bacillosis" for this disease.

1003 - **New Ichneumonoidea Parasitic on Leaf-Mining Diptera.** — GAHAN, A. B. in *The Canadian Entomologist*, Vol. XLV, No. 5, pp. 145-154. London, 1913.

A systematic description of 5 new species of the genus *Opius* (*O. utahensis, O. suturalis, O. aridis, O. bruneipes, O. succineus*) and of 2 new species of the genus *Dacnusa* (*D. scaptomyzae, D. agromyzae*) recognized as parasites of Diptera (*Agromyza parvicornis, A. pusilla, Agromyza* sp., *Scaptomyza flaveola, A. angulata*) living at the expense of the leaf parenchyma of various plants in different parts of the United States of America.

1004 - ***Anagrus flaveolus* Waterhouse, a Parasite of *Peregrinus (Delphax) maidis*, the Corn Leaf-Hopper, in Trinidad.** — WATERHOUSE, CHARLES O. On a new species of Mymaridae from Trinidad. — *Bulletin of Entomological Research*, Vol. IV, Part I, p. 87, 1 fig. London, 1913.

This paper gives a detailed description of *Anagrus flaveolus*, which was bred from eggs of *Peregrinus* (*Delphax*) *maidis* in Trinidad.

The Editor of the *Bulletin of Entomological Research* notes that *A. flaveolus* is extremely closely allied to *A. frequens* Perkins, originally described from Hawaii, and *A. columbi* Perkins, from Colombus, Ohio, being intermediate between them. The three forms may be local races of a single species. *A. frequens* has a wide range and attacks four different genera of leaf-hoppers in Hawaii, including *Peregrinus maidis*.

INSECTS INJURIOUS TO VARIOUS CROPS

1005 - **The Red Clover Gall Gnat (*Amblyspatha ormerodi* Kieffer).** MACDOUGALL, R. STEWART in *The Journal of the Board of Agriculture*, Vol. XX, No. 3, pp. 225-230, figs. 1-6. London, 1913.

During the winter of 1912 and the succeeding spring, there was a great destruction of red clover (*Trifolium pratense*) in England. The counties which suffered most were Norfolk, Suffolk, Essex, Lincoln, Huntingdon, Cambridge, Surrey, Hereford and Shropshire. In practically all the samples received, red maggots (belonging to a Cecidomyid) were found, either in the soil surrounding the plants, or, on dissection, in the spoiled plants. The writer bred out a number of adult flies from the diseased plants, which he submitted to Professor Kieffer, who identified the new fly as belonging to the genus *Amblyspatha* and the species has been named *ormerodi* Kieffer; other animal and plant parasites were also found on the diseased clover, the most important being the fungus *Sclerotinia sclerotiorum* and the eelworm *Tylenchus devastatrix*, the latter fairly common.

From the large numbers of the Cecidomyid larvae, and the position of many of them, *A. ormerodi* can scarcely be regarded as other than a direct and distinct enemy of red clover. It is worthy of note, as a preventive measure, that it was observed that there was no disease on the part of the field which had been fed off closely by sheep, while the plants in the other part were badly attacked. After the harvesting of the cereal crop, when the conditions are such as to lead to a strong growth of clover, and therefore offer suitable plants on which the midges can lay their eggs, it would be wise to have this clover cut, or eaten off by sheep.

Badly infested plants should be ploughed in deeply in order to prevent the larvae and pupae reaching the surface again. Plants that look poor in winter may recover, for red clover is hardy, and can withstand considerable attack. This was proved by the writer who grew some of the diseased specimens of red clover sent to him for examination.

1006 - **Turnip Moth Larvae injuring Tobacco in Hungary.** — GRÓF, BÉLA in *Magyar Dohánynjsag*, Year XXX, No. 11, pp. 3-4. Budapest, June 5, 1913.

Early in June, 1911, the writer found some diseased tobacco plants in the fields of the Tobacco-Growing Experiment Station at Debreczen; the leaves showed yellow spots, whose shape and position suggested the presence of a fungus. These spots were at first round, but later became angular; they occurred very regularly along the side veins of the lower leaves; they increased in number and spread to about half an inch in diameter; on some of the leaves they formed large yellow areas.

As a microscopical examination failed to reveal any fungus action, the roots were examined; here larvae of the turnip moth (*Agrotis segetum* Schiff), were found, tunneling in the ground about two inches below the surface and destroying the roots one after another.

To get rid of the larvae, a search was made at two or three inches below the surface at the roots of all plants showing the first signs of the disease.

1007 - ***Pseudococcus nicotianae*** **n. sp., a Scale Insect Injurious to Tobacco in Italy.** — LEONARDI, G. Cocciniglia dannosa al tabacco. — *Bolletino tecnico della coltivazione dei tabacchi pubblicato per cura del R. Istituto sperimentale in Scafati (Salerno)*, Year 12, No. 2, pp. 75-80, figs. 1-4. Scafati, March-April 1913.

A systematic description of *Pseudococcus nicotianae* n. sp. made from specimens sent to the writer by the Director of the Royal Experimental Station for Tobacco Growing at Scafati (Salerno). This new scale insect does not appear to be of Italian origin, for its presence in Scafati coincides with the introduction from Germany of its host plant, *Nicotiana colossea* Andr. (1). Further, until the present time, the presence of the insect had not been recorded at Scafati, or elsewhere in Italy. *Pseudococcus nicotianae*, though confining its attacks to specimens of the variety of tobacco with which it was introduced, and to a kindred variety, *N. macrophylla colossea*, does a good deal of injury to these plants, whether they be wintering in greenhouses or growing in the open.

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(1) According to the *Index Kewensis, Nicotiana colossea* Ed. André is a synonym of *N. tomentosa* Ruiz and Pav. (*Ed.*).

1008 – **Pumpkin Beetles and how to destroy them.** — JARVIS, E. in *The Queensland Agricultural Journal*, Vol. XXX, Part V, pp. 326-333, plates 51-52. Brisbane, 1913.

The genial climate of Southern Queensland is eminently suitable to the growth of pumpkins, marrows and other *Cucurbitaceae*, which flourish luxuriantly in almost any situation, and as a rule, require little or no attention. Unfortunately, however, these plants are subject to the attacks of insect enemies, which not only devour the foliage and flowers, but frequently kill seedlings and young plants.

These pests the writer describes, together with their host-plants, life-histories, and the best methods of control (1).

The most destructive is *Aulacophora olivieri* Guérin (the banded pumpkin beetle), though *A. wilsoni* Baly (the plain pumpkin beetle), *A. Cartereti* Guérin (the northern banded pumpkin beetle), and *Epilachna 28-punctata* Fabr. (the 28- spotted ladybird beetle) also attack *Cucurbitaceae*.

1009 – **Some New and Unusual Insect Attacks on Fruit Trees and Bushes reported in England in 1912.** — THEOBALD, F. V. in *The Journal of the Board of Agriculture*, Vol. XX, No. 2, pp. 106-116, figs. 1-2. London, May 1913.

Several interesting attacks of insects on fruit trees and bushes have to be recorded for 1912. Amongst those of special interest is an Apple-leaf Sawfly (*Lygaeonematus moestus* Zaddack) not previously recorded as British, and two aphides which have not hitherto been described: the Delicate Strawberry Aphis (*Myzus fragariae*) which attacks strawberries, and the Northern Currant Aphis (*Rhopalosiphum brittenii*) a parasite on currants. It is also interesting to note the change of host plants by two other insects, the Beech Orchestes (*Orchestes fagi*) recorded as feeding on apples in Devonshire and the Ash and Willow Scale (*Chionaspis salicis*) attacking currants at Woburn and Wye.

Three well-known insects are also recorded for the first time as attacking fruit in Great Britain: the Garden Chafer (*Phyllopertha horticola*) on apples, the V-Moth (*Halia wavaria*) on currants and gooseberries, and *Pseudococcus aceris* Signoret, the Sycamore Coccus, on apple trees. A new Capsid Bug (a species of *Atractonomus*) on apples in Suffolk and Hereford is also worthy of notice. The number of *Capsidae* attacking apples is gradually increasing.

In addition to describing the above-mentioned species which are of especial interest, the writer gives an account of three other parasites which have been recorded previously to 1912: the Pear Leaf Curling Midge (*Cecidomyia pyri*, Bouché) attacking the leaves of the pear; the Dark Green Ribes Aphis (*Aphis grossulariae* Kaltenbach) which deforms the top shoots of gooseberries and currants; and *Epetrimerus* sp. found on apple leaves.

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(1) See also No. 2363, *B.* July 1911. (*Ed.*).

1010 - **Notes on Scale-Insects *(Coccidae)*: Part I.** NEWSTEAD, R. in *Bulletin of Entomological Rseearch*, Vol. IV, Part I, pp. 67-81, figs. 1-11. London, 1913.

Amongst the scale insects enumerated by the writer in this first list, the following are of special interest:

Icerya purchasi Maskell, a new pest for Zanzibar, where it is found on oranges and other species of citrus.

Dactylopius (*Pseudococcus*) *obtusus* Newstead, common in Zanzibar, especially on the leaves and fruit pedicels of the mango (*Mangifera indica*). Judging by its enormous numbers, this insect must cause serious injury to the plants it infests.

Ceroplastes coniformis n. sp., taken on *Ficus* sp. in the Botanic Gardens of Entebbe, Uganda. *C. Ugandae* Newstead, found on *Anona muricata* at Entebbe.

Lecanium (*Saissetia*) *oleae* (Bernard), in the same locality on the hard wood of an un-named. tree. All the examples were abnormally swollen by the attacks of Chalcid parasites. *Lecanium* (*Saissetia*) *nigrum* Nietner, also found at Entebbe, abundant on the leaves of *Anona muricata. Aspidiotus gowdeyi* n. sp. occurred in the same locality and on the same host plant.

Chionaspis unilateralis on the leaves of a palm (*Thrinax*) in Barbados.

Leucaspis riccae Targioni - Tozzetti, new for Egypt (Cairo), where it was found on the cultivated olive, which seems to be its chief host plant. It is certainly an injurious species, and has been previously recorded from France, Italy, Greece and Cyprus.

Mytilaspis (*Lepidosaphes*) *beckii* (Newman), better known under its old name *Mytilaspis citricola* Packard, on orange trees at Zanzibar.

1011 - **Cicadas (*Melampsalta incepta*) damaging Peach.** — FROGGATT, WALTER W. Cicadas as Pests. *Melampsalta incepta*, Walk. — *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 4, pp. 341-344, 3 figs. Sydney, 1913.

Early in November, 1912, several orchards in the Penrith district (New South Wales) were infested with a small black cicada, afterwards identified by the writer as the common wattle cicada (*Melampsalta incepta* Walker), which completely covered many peach trees. The punctures made by the insects in the bark of the trunk and branches had caused them to gum all over and had done serious damage to the trees. Under a square inch of bark removed from a badly infested branch, the writer counted 45 punctures, and this was a fair average of the condition of many feet of the trunk and branches of a number of trees in this orchard at Kingswood, which was one of the first to be invaded by *Melampsalta*. The cicadas swarmed into the orchard on November 7 and remained for about 10 days; at the time of the visit of the writer, November 21, there was only an odd insect here and there on the trees.

On October 26, several specimens of the pest were forwarded from Dapto on the South Coast, where it was doing much harm to the fruit trees.

Melampsalta incepta was described by Walker in 1850 in South Australia, but it has now a very extended range right round the coast, through

Victoria and New South Wales into Southern Qeensland, and in 1912 it was very plentiful in several localities near Melbourne.

1012 – ***Ceronema africana* sp. n. on *Caesalpinia pulcherrima*, and *Dactylopius (Pseudococcus) virgatus* var. *madagascariensis* on *Ficus sp.* in Northern Nigeria.** — MACFIE, J. W. SCOTT. On a new African species of Coccidae. - *Bulletin of Entomological Research*, Vol. IV, Part I, pp. 31-34, fig.s 1-3. London, 1913.

The writer gives a detailed description, under the name of *Ceronema africana* sp. n, of a scale insect found on the "Pride of Barbados" (*Caesalpinia pulcherrima* Sw), a prickly shrub growing to a height of 5 to 10 ft., which, on account of its showy red or yellow flowers, is a favourite in the gardens and compounds of Nigeria. This is apparently the first recorded occurrence of this genus in Africa.

The writer also mentions *Dactylopius* (*Pseudococcus*) *virgatus* var. *madagascariensis* Newst., as occurring plentifully on the youngs hoots of a tree called by the natives "chedia" (*Ficus sp.*). This insect has been recorded elsewhere as feeding upon cactus, coconut palm, cotton, violets, etc., and the species is also apparently new to the continental African fauna.

1013 – ***Icerya purchasi* and *Novius cardinalis* in the Province of Beira Baixa (Portugal)** (1). — MENDES, C. Apparecimento da *Icerya purchasi* e *Novius cardinalis* em S. Fiel. — *Broteria*, Vol. XI, Zoological Series, Part. II, p. 146. Salamanca, June 1913.

In 1910, at the beginning of the summer, a large number of *Icerya purchasi* were observed on the trunks and branches of *Acacia melanoxylon*, on the farm belonging to the Collegio of S. Fiel (Beira Baixa). The orange trees on the same farm and in the neighbourhood remained entirely immune; this scale insect, however, attacked the acacias in large numbers. Shortly afterwards in the same district, the presence of *Novius cardinalis* was recorded for the first time, and within a year all the *Iceryae* were destroyed by this natural enemy.

Researches as to the origin of the disease brought to light the fact that at Castello Branco, 12 miles from S. Fiel, *Icerya* had attacked some oranges which were thereupon thrown into the dust-bins. Shortly after this, the acacias were attacked by the scale insect.

1014 – **The Red Spider on Cotton.** — MC GREGOR, E. A. — *U. S. Department of Agriculture, Bureau of Entomology, Circular* No. 172, pp. 22 + figs. Washington, May 17, 1913.

A red spider (*Tetranychus bimaculatus* according to Harvey and Banks; *T. telarius* according to Morgan and Berlese) appears to be becoming a serious cotton pest in the United States. It is now prevalent throughout the cotton belt. Seasons of excessive drought are favourable to the development of the mite, and at such times the pest increases so rapidly that the damage often becomes severe before its presence is detected.

With the exception of an outbreak in Louisiana in 1893 no severe occurrence of red spider on cotton had been reported until 1903, at which time complaints of damage came from S. Carolina and Georgia. In 1905 it caused serious injury in the above States, in N. Carolina and in Alabama. Since then its presence has been established from Maine to Florida and westward to California, as well as in the Hawaiian Islands. With the exception of western Colorado and portions of California no complaints of an alarming nature regarding this pest have come to the writer's attention other than from the south-eastern portion of the cotton belt.

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(1) See also No. 891, *B.* July 1913. (*Ed.*).

A detailed description of the insect in its various stages may be summarized as follows: The female lays 50 to 60 eggs on the under surface of the leaves. The eggs are perfectly round and colourless, and during the warmer months they hatch in about 4 days after being laid. Each of the larval periods (with six legs) and of the primary and secondary nymph (with eight legs) lasts in summer two days. Almost immediately on becoming adult the red spiders mate and begin egg laying. In South Carolina the time required for a single generation is 10 or 11 days throughout the summer months; in a year there may be about 17 generations.

The colonies of the parasite live on the under surface of the cotton leaves, and where the spiders are very abundant the web may become quite conspicuous. Feeding continues throughout the period of egg laying, causing the appearance of a wine-red spot on the upper surface of the leaf; as the leaves become badly infested they redden over the whole surface, become distorted and drop, often causing the death of the plant.

When cotton dies or becomes untempting in the late fall the red spiders seek more suitable food plants. Up to now they have been seen upon over 90 species of plants. Throughout the active season they are common upon beans, cowpeas, dahlia, ironweed, Jerusalem-oak weed, Jamestown weed, okra, tomato, wild blackberry, wild geranium, pokeweed and English violet. It appears, however, that the greatest number of red spiders that pass the winter do so on the two latter plants.

Heavy and long-continued rain works havoc to the red spiders and early and late frosts destroy the young stages and probably some adults also. On the other hand the insect enemies of the mites succumb more easily to minimum temperatures than do the mites themselves, whence very cold winters are often followed by severe infestations.

Hot weather, although favouring red spider development, probably encourages even more the increase of insect enemies, of which several have been observed. The following are the most important observed at Batesburg; S. C., in 1912: *Arthrocnodax* sp. (Itonidae); *Triphleps insidiosus* Say (Anthocoridae); *Chrysopa quadripunctata* Burm.; *Euthrips fuscus* Hinds., and *E. occidentalis* Pergande; *Scolothrips sexmaculatus* Pergande; *Coccinella 9-notata* Hbst.; *Hippodamia convergens* Guér.; (*Scymnus*) *Stethorus punctum* Lec.

As means of prevention and control the writer recommends:

1. *Clean culture.*—Namely the destruction of weeds and plants which breed the pest. Pokeweed, Jerusalem-oak weed, Jamestown weed, wild blackberry and all border weeds and underbrush about fields should be burned or grubbed out.

2. *Control on violets.* — Destruction or careful spraying of all violets growing in the neighbourhood of cotton fields.

3. *Selection of Variety.* — Avoiding those varieties of cotton which are more susceptible to red spider infestation, such as Dixie, " Wilt Proof ", Toole Peterkin, Bradwell, and Cook, and which suffer most in the order named, while Hite, Russell, Summerour "Half and Half" and Cleveland showed the greatest immunity of all the varieties investigated.

4. *Broadcasting cotton.* — Thickly broadcasting cotton at the boundary of a field as trap-crop for red spiders and ploughing it in.

5. *Removal of infested plants.* — If infestation has not advanced far pulling up and destroying the first few infected plants may give very satisfactory results.

If on the contrary infestation has spread until a considerable patch is involved, it is sometimes advisable to plough up all the affected part in order to save the rest. Ploughing a swath about 10 feet wide round the infested spot and burning all the stalks in the swath and the enclosed area is also useful.

6. — Spraying the under side of the leaves with one of the six mixtures given below, which proved to be the most satisfactory out of 26 combinations which were thoroughly tested in 1911.

7. — Destruction of the winter quarters of the parasite.

Formulae and items	Total cost	Per cent. killed
	$	
Potassium sulphide, 3lbs. at 25 cents . . . . Water 100 gallons	0.75	100
Flowers of sulphur, 15lbs. at 4 cents . . . . } boiled { $ 0.60 Fresh lime, 20lbs. at 4 cents . . . . 0.80 Water 100 gallons	1.40	100
Miscible oil, 5 gals. at $ 1 . . . : . . . . Water to make 100 gals. (1 to 20.)	5.00	100
Miscible oil, 2 ½ gals. at $ 1 . . . . $ 2.50 Blackleaf tobacco extract, 40 % nicotine sulphate, 26 oz. at $ 1.25 per lb. . . . . 2.00 Water to make 100 gals.	4.50	99
Flowers of sulphur, 28 lbs., at 4 cents . . . . $ 1.12 Soft soap, 14 oz., at 40 cents per lb. . . . . 35 Water to make 100 gals.	1.47	98

ALFREDO RUGGERI, gerente responsabile.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.
The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Present Condition of Agricultural Meteorology in Brazil

by

HENRIQUE MOREZ

Director of Meteorology and Astronomy at the Ministry of Agriculture of Brazil.

Before the formation of the Ministry of Agriculture, the Brazilian Government possessed no meteorological organization. The State of S. Paulo had, however, already arranged for its own purposes a service which was in regular working. One of the first concerns of the first Minister of Agriculture was to reform the old observatory and to arrange for it to organize a meteorological service capable of meeting agricultural needs. The new establishment started its work at the beginning of 1910, but the first year's efforts were largely of a preparatory nature, and the proper working began in the following year; its activities are steadily developing, and will continue to do so till a sufficient network of stations covers the three million square miles of the national territory.

The object of this service is twofold: its principal aim is to provide all the data required by agriculture, while the second is to carry out as many scientific determinations of general interest as are compatible with the resources of the service without in any way interfering with the work of direct utility. This is the spirit in which the organization has been conceived and is developing.

Each territory of the State forms an agricultural district and likewise constitutes a meteorological district. In each district which reaches a number of stations corresponding to one per 8000 sq. miles, with a minimum of ten altogether, a Central Station will be founded; this will undertake the direct control of the stations in the district, and will send the required figures to the National Observatory at Rio de Janeiro, which directs the whole. Till this stage is reached, the National Observatory exercises direct control over the stations

State Governments which wish to collaborate with the Federal Government for the development of agricultural meteorology are entitled to a subvention, consisting first in the free furnishing of the instruments required, and later in the payment of half the expenses of upkeep. To have the right to this assistance, the Governments must undertake to have the observations made according to the rules drawn up for the federal stations, and to allow their services to be inspected by the officials of the National Observatory appointed by the Director. So far, only the services of S. Paulo and Rio Grande do Sul have been admittod under these conditions, but Minas Geraes is at present equipping its own, and Bahia proposes to do so.

This liberal disposition of the Federal Government reduces the difficulties encountered by the National Observatory in setting up numerous stations in the interior of so vast a country as Brazil. Till recently the positions of the observation points were chosen more or less by chance on the coast or along means of communication, such as railways and navigable rivers. As a result of this, there is a fairly wide belt along the coast in which there are a sufficient number of stations for the climatic conditions to be considered as known. But the vast interior, in places covered with great forests and elsewhere consisting of wide savannahs, is still very little known; it is particularly in these regions, where communication is difficult and there is little chance of finding capable observers, that new stations are required. In this, the local Governments can be of great assistance owing to their knowledge of places and people, which makes easy for them what would be a very difficult task for anyone sent out from the Rio Observatory and not knowing the country.

The number of stations of all classes, including those belonging to subsidized services, is two hundred. For a knowledge of the climate of all parts, sufficiently exact for agricultural requirements in deciding the possibility of introducing new crops or of extending the old ones, at least twice the number are required. It is probable that as soon as the early difficulties are overcome, persevering efforts will result in this end being reached within a few years.

The stations of the Brazilian service conform strictly to the resolutions adopted by several Meteorological Congresses and combined in the “Codex” published by the International Meteorological Committee.

The central observatories, at present three, are placed in class I; they make hourly observations of all the usual elements, and possess registering instruments of the best types, allowing them to undertake investigations of special subjects, such as the rate of spread of storms, evaporation under various conditions, study of the electric potential of the air, etc., etc.

The stations of class II have all the directly-read instruments for determining the usual elements, as well as registering instruments for pressure, temperature, humidity and rainfall.

The stations of class III have no registering instruments; but they make the same observations as those of class II except for duration of sunshine.

The pluviometric stations have only rain-gauges. The observations are everywhere made at the international hours: 7 a. m., 2 p. m. and 9 p. m., for stations of classes II and III-B. Those of class III record only at 7 a. m. and 9 p. m.

The stations of class III-A, besides the climatological observation at these two hours, make a complete observation at the local time corresponding to Greenwich noon; the stations of class II also do this, and the records are telegraphed to Rio to be used in weather-forecasting.

Though forecasting is a part of the regular function of the service, it has not yet been carried very far, as the stations are too few and too irregularly distributed to allow of a reasonable forecast being drawn up; another reason is that true cyclones are unknown in Brazil: although this is a fortunate circumstance, yet it removes the very feature which is mostly readily forecasted. All the efforts are therefore directed to the climatological side.

As soon as the National Observatory is removed to its new building, it will undertake careful and prolonged observations, such as have been almost impossible under present arrangements, to wit: evaporation from large free surfaces; warming of soils of different kinds, at different depths, and under various types of vegetation; continuous determination of the solar constant (at present only made sporadically); electric conductivity and estimation of the ions in the atmosphere, etc., etc.

As the north-east of Brazil is subject to the scourge of drought, sustained observations are now being carried on as to the amount of rainfall, so as to determine the possibility of introducing dry-farming methods.

Brazil possesses immense regions covered by vegetation, in places forest and in places " campos " or savannah. The verge of the latter has lately been steadily impinging on the territory of the forest. The question as to whether this deforestation makes the climate more arid is still unsettled, but may be determined in a few years by observations in the limiting zones, under the same conditions of latitude and altitude.

The Upper Uruguay is subject to periodical floods and low waters, the difference in level being more than 30 feet. During droughts, the river is not navigable owing to falls and projecting rocks. The country along the banks is rich, and produces abundance of maté and good building timber, for which the only practicable means of exportation is the river. In the dry season the rivermen build long trains of wood and plank boats on sandbanks then exposed, filling the boats with bales of maté. When the flood comes these float off by themselves, and they are guided down the river in lines, reaching Urguuayana in a month or two; if the water is very high they go on as far as Concordia, where the timber and the maté make good prices. The boats are also demolished, the planks sold, and the bolts carried up again on horseback to serve for the next year.

It not infrequently happens that the main lasting flood is preceded by "repiquetes", or little floods, which do not last. If the riverman mistakes them for the main flood, he runs the risk of having his train ground and break up among the rocks when the water falls. On the other hand, waiting too long for the flood to get well established may mean that the train does not reach a good port before the flood is past, as it does not last very long; in this case, also, the cargo would be lost, especially seeing that the maté ferments and spoils in a short time under such warm and moist conditions. Consequently the rivermen are always on the look-out for the real flood. This depends on the setting in of the rains in the regions of the headwaters, that is Santa Catharina and Paranà. When the date of this is known with certainty, the flood will be able to be foretold several days in advance.

The same phenomenon occurs in the Amazon region, affecting other products; but it is difficult to get any exact knowledge of the period of rains in the district of the sources, as the upper tributaries occupy a large and sparsely populated area.

This sums up the principal agricultural problems occupying the attention of the Meteorological Service; it is to be hoped that persevering efforts will result in the resolution of these and other problems which may arise, to the great benefit of the country, of which agriculture will for long yet be the principal and most fruitful resource.

The Possibility of Using Crude Phosphates (1) and Limes containing Silica as Manures

by

Prof. Th. Pfeiffer,

Director of the Institute of Agricultural Chemistry and Bacteriology in the University of Breslau.

One of the most important nutrient materials for plants, namely phosphoric acid, occurs in large accumulations in nature only under the form of salts soluble with difficulty, in particular as tri-calcium phosphate. As has long been known, the characteristic mentioned makes these crude phosphates (Rohphosphate) in general unfit for immediate use as manures. It should be remembered, however, that the form of combination of the phosphoric acid is not the only decisive factor in its utilization by plant roots; much more frequently other factors come into play. In this connection the remarkably slight action of many phosphorites in comparison with that of bone meal will be remembered; experiments carried out by MITSCHERLICH (1) well illustrate this point; comparing 0.4 gm. of P_2O_5 as precipitated tri-calcium phosphate, with an equal amount as crude phosphate, he obtained the following results, expressed as increase (+) or decrease (—) in dry matter in the pot without phosphatic manure:

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(1) Undissolved bone meal may to a certain extent be classed with the crude phosphates, but it differs from them so widely in its origin and action, that it is necessarily excluded from the present article.

Precipitated tri-calcium phosphate . . .	+ 27.8 ± 2.21 gm.
Crude phosphate.	2.6 ± 0.47 gm.

It is not to be wondered at that interested persons are constantly trying, to the detriment of agriculture, to palm off crude phosphates as valuable manures, frequently giving them fine names, and quoting the good results of experiments with similar substances obtained here and there under special conditions.

In giving an outline of the utilization of crude phosphates as manures, I must, after these preliminary remarks, confine myself to some of the more important points in the action of these substances, utilizing for the purpose the most recent literature.

A.

I. Prof. A. N. ENGELHARDT (2) has had remakably good results on his estate of Batishtchev, in the Government of Smolensk, by the application of finely ground phosphorites of Russian origin. "The Podolian phosphorites form an exception, being frequently quite without action; they resemble the French *crystalline* Beauval phosphorites, which, however finely ground, are hardly assimilable, and require to be made into superphospates". This restricting statement draws attention to the importance which physical condition has on the possibility of utilization of phosphorites. In the some way TACKE (3) speaks of "weicherdigen Phosphaten" (earthy phosphates), which are much more easily attacked by the soil agents than "felsigen Phosphaten" (stony phosphates). A French phosphate from the chalk, only 30.2 per cent. citrate-soluble, was tried by H. SVOBODA (4) on three meadows with sandy loam soil underlain by rubble; it gave remarkably good results, even in places doing better than basic slag. In this case also it seems reasonable to consider that the phosphate has a physical structure specially capable of being broken down.

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(1) *Landw. Jahrbücher*, 1912, p. 412. PRIANISHNIKOV reports similar results (*Landw. Vers. Stat.*, 1902, p. 122 *et seq.*): it is further to be mentioned that the same investigator found *precipitated* aluminium phosphate also utilizable by plants, and GUILLIN (*Journal d'Agriculture pratique*, 1907, I, p. 171) reckons that a similar preparation has given as good results as superphosphate.

(2) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 3, 1900, p. 631.

(3) *Hannov. Land- und Forstwirtschaftliche Zeitung*, 1909, p. 414.

(4) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 11, 1908 p. 733.

Further experiments in the same direction were those of Th. Pfeiffer and E. Blancke (1) with pot cultures, using sand; they found that Estramadura phosphates had no action on the growth of oats or lupins, while phosphorites from Kasan and Smolensk (used in another year, but under precisely similar conditions) produced a decided increase. Lastly, may be quoted manuring experiments made by H. G. Söderbaum (2); the increase of yield produced by a Tunisian phosphate was 22.2 per cent. of that produced by superphosphate, while the so-called "Bernard phosphate", prepared by calcination of Belgian crude phosphates, was absolutely without effect.

II. "In all cases earthy crude phosphates (Algerian, Gafsa, etc.) do better than basic slag on sour peatmoor (Hochmoor) soils and those similar to them. On sour mineral soils rich in humus, reclaimed from heath or long manured with heath turves (Heideplaggenstreu), basic slag may be replaced by the crude phosphates mentioned, provided the amount of free acid in cultivated land (reckoned on the dry matter) is about 0.05 per cent., or in meadow land 0.10 per cent.; but the dressing of phosphoric acid must be one-fifth greater than in the basic slag". This quotation from the article by Br. Tacke already mentioned, brings out very clearly the second important point, namely the significance of the *soil* in the action of crude phosphates. Comparatively good results were obtained by Arthur Rindell (3) on a well humified moor soil to which loam had been applied; Algerian phosphates gave an increased yield equal to 60 per cent. of that given by basic slag in the case of cereals (reckoning the general average of grain and straw) and 91 per cent. in the case of a seeds-ley. Quite different results were obtained in experiments by W. Schneidewind and D. Meyer (4) on a humous loess-loam soil containing about 1 per cent. of lime; here crude phosphates showed no results on oats grown for the first two years, and only began to take effect in the following five years, giving an increased yield of various crops up to 36 per cent. of that of basic slag. Remarkably irregular results are recorded by Th. Remy (5) from manuring with Algerian phosphates: in some cases the effect was considerable, in others almost none; considering that there were no controls, this should be attributed primarily to differences in the soil. But these differences are not confined to soils showing different degrees of acidity, for the researches of K. Gedroiz (6) show that they occur in soils with completely neutral reaction. He refers it to the unsaturated condition of the soil as regards bases.

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(1) *Landw. Versuchsstationen*, Vol. 77, 1912, p. 217.

(2) *Meddelande N.* 56 *från Centralanstalten för Försöksväsendet på Bruksområdet*. Stockholm, 1912. — Abstract to *Centralblatt f. Agric. Chemie*, 1912, p. 447

(3) *Finska Mosskultur För.*, 1906-1907, 3, p. 182; *Ibid.*, 1910, p. 101. Abstracts in *Jahresbericht für Agrikultur-Chemie*, 1908, p. 182, and *Centralblatt für Agricultur-Chemie*, 1911, p. 593.

(4) *Landw. Jahrbücher*, Vol. 39, III, 1910 p. 236.

(5) *Landw. Jahrbücher*, Vol. 40, 1911, p. 560.

(6) *Russisches Journal f. experim. Landw.*, Vol. 12, 1911, pp. 539 and 816.

In considering the soil, the part played by *bacteria* in bringing crude phosphates into solution should not be forgotten. J. STOKLASA (1) even attributes the most important action to them; but in any case the investigations reported by E. KRÖBER (2), by W. G. SACKETT, A. I. PATTEN and CH. W. BROWN (3), by S. A. SEVERIN (4), and others, leave no doubt that soil organisms of various kinds induce liberation of phosphates by forming acids, and very likely also directly. Here again. as far as comparisons have been made, the earthy phosphates have shown themselves comparatively readily assimilable.

III. D. PRIANISHNIKOV (5), mentioning occasional references in previous literature. was the first to emphasize the fact that different plants show decidely different powers of dissolving phosphorites. He estimates the power of utilizing the phosphoric acid of phosphorites, as compared with that of monocalcium phosphate, at 0 to 10 per cent. for cereals, and 10 per cent. for buckwheat and lupins. In further work (6) he was led to the conclusion that "the differences in the power of solubilization of different plants are of more importance than differences in the properties of the crude phosphates".P. KOSSOVITCH (7) extends this point by stating that according to his investigations not only is the utilization of slightly soluble phosphates very unequal with different plants, but that one and the same plant behaves differently as regards the power of solubilizing phosphoric acid of different origins. Further experiments on this point are those of TH. REMY (*loc. cit.*) and A. BAGULEY (8). Remy got good results with Algerian phosphates on oats, peas and especially blue lupins, but not on rye and spring barley. Baguley was investigating the question (not strictly within the scope of this article) of the effect of ignition on the availability to plants of ferric and calcium phosphates, he found differences between oats on the one hand and peas and swedes on the other.

The explanation of these phenomena —whether the plant roots bring varying amounts of organic acids to bear, besides carbon dioxide, or whether the different degree of development of the root system plays some part—cannot be discussed here (1).

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(1) *Centralblatt für Bakteriologie* II, Vol. 29, 1911, p. 385..

(2) *Journal für Landwirtschaft*, Vol. 57, 1909, p. 5.

(3) *Centralblatt für Bakteriologie* II, Vol. 20, 1908, p. 688.

(4) *Ibid*,, Vol. 32, 1912, p. 498. — In a first series of experiments (*Ibid.*, Vol. 28, 1910, p. 561) different results were obtained.

(5) *Landw. Versuchsstationen*, Vol. 56, 1902, p. 107. — The same author gives information on the influence of the soil on the solubility of crude phosphates, which should be referred to section II.

(6) *Landw. Versuchsstationen*, Vol. 65, 1907, p. 23.

(7) *Russisches Journal für experiment. Landwirtschaft*, Vol. 10, 1909, p. 839.

(8) *Journal of Agricultural Science*, Vol. IV, 1912, Part 3, p. 313. Abstract in *Centralblatt für Agrik.-Chemie*, Vol. 41, 1912, p. 675. (Also No. 638, *B* April 1912. *Ed.*).

IV. The merit of having first discovered the dissolving action of *physiologically acid salts* (2), especially ammonium sulphate, on crude phosphates belongs also to **Prianishnikov** (*loc. cit.*). **E. Kröber** (*loc. cit.*) has carried this one step further, by showing that nitric acid is produced during the nitrification of ammonia or indirectly in the nitrification of organic compounds.

Physiologically basic salts should naturally have the opposite effect; in this connection, it has been shown many times for bone meal that the addition of sodium nitrate or calcium carbonate (which directly stops the action of acids) greatly lowers the utilization by plants of the contained phosphoric acid, or even completely prevents it. A demonstration experiment very readily carried out is the following: sand-cultures are treated with bone meal and potassium sulphate, and the nitrogenous manuring is given as 1) ammonium sulphate, 2) ammonium sulphate and calcium carbonate, 3) sodium nitrate. The result is that only the plants with the first nitrogenous manuring show luxuriant growth, while the others show evident lack of phosphates (3).

Considering these four points together, we may conclude that crude phosphates may be useful manures under particular conditions and for special purposes, but that much caution should be exercised in using certain substances of this nature recently placed on the market, at any rate till their value has been ascertained without any possibility of doubt.

B.

There is a general opinion, at any rate as far as one may judge from German literature, that quicklime containing fairly considerable quantities of soluble (hydrated) silicic acid is unsuitable as a manure, the idea being that its application will lead to the formation of hard cement-like lumps in the soil.

H. Immendorff (4) has shown that such fears are quite unfounded; this conclusion has been reached as the result of exhaustive experiments, partly carried out by his pupil **Meyer** at Bexten and only published

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(1) See also the article by **Th. Pfeiffer** and **E. Blanck** referred to above.

(2) This is the term adopted by **Ad. Mayer** for salts whose base is absorbed by plants more readily than the acid. Conversely we may speak of "physiologically basic salts", such as sodium nitrate.

(3) As sources for the facts given in section IV, the following may be mentioned: **C. von Seelhorst**, *Journ. f. Landw.*, Vol. 51, 1903, p. 212; **A. Rindell**, *l. c.*; **O. Bötcher**, *Landw. Vrrsuchsstat.*, Vol. 65, 1907, p. 407; **H. G. Söderbaum**, *Ibid.*, Vol. 68, 1908, p. 433; **J. Sebelien** (abstract by the author), *Centralblatt f. Agric.-Chemie*, Vol. 38, 1909, p. 801; **D. Prianishnikov**, *Landw. Versuchsstat.*, Vol. 75, 1911, p. 357.

(4) *Mittlg d. Deutsch. Landw. Ges.*, 1911, p. 514; *Landw. Versuchsstat.*, Vol. 79-80, 1913, p. 891.

in extenso later. " Limes rich in silica (1) behave exactly like silica-free lime from marble as regards their loosening effect on the soil, provided the soil is given the same amount of active material (CaO + MgO) Caking of the surface or formation of lumps in the soil are impossible with all limes, and even with cement, provided the spreading is properly carried out ". Immendorff is even inclined to consider the presence of some hydrated silica in lime as advantageous, as this may increase the amount of zeolitic material (mixtures of gels), and so increase the absorptive power of the soil. At any rate limes containing silica need no longer be excluded for manurial purposes.

Recent Progress in Belgian Horticulture

by

M. Vernieuwe,

Director General of the Horticultural Office of Belgium.

The quinquennial international horticultural show, held at Ghent (2) in April and May of the present year, which has been fully described in the press, has once more given a striking demonstration of the importance which horticulture has attained in Belgium.

The buildings in which this exhibition was arranged comprised a showroom covering 17 000 sq. yds. and a hothouse 7000 sq. yds. in area. In the showroom one exhibitor, competing for a prize offered, collected together five hundred species and varieties of plants which had been shown in the various exhibitions at Ghent from 1808 onwards. This is a characteristic detail, showing how horticulture, after ceasing to be a hobby of people favoured by fortune, has taken up all possible new plants to feed the trade during the hundred years that have passed.

The Belgian horticultural industry is specially developed in Flanders, and its capital, Ghent, has retained the monopoly of the export trade in its products. Ghent and its suburbs, with several communes further from it, have more than a thousand horticultural establishments, whose area varies from a few rods to 25 or 30 acres. It has also developed greatly in the last twenty years round Brussels and Bruges, as well as to some extent in other places, particularly Antwerp and Liège.

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(1) Including a Portland cement containing 19.51 per cent. of silica soluble in hydrochloric acid.

(2) The Ghent horticultural shows are organized by the Royal Agricultural and Botanical Society, founded in 1808. The first international show was held in March 1837. Since that time the quinquennial international shows, as well as a large number of local shows and competitions, have been held regularly.

According to the register of horticultural establishments and holdings conforming to the regulations of the Berne Phylloxera Convention, and consequently subject to the inspection required by this international act, Belgium has over 1800 horticultural concerns (1) distributed as follows in the different provinces of the kingdom :

	Total	Percentage
Antwerp	98	5.3
Brabant	139	7.4
West Flanders	173	9.2
East Flanders	1 019	54.5
Hainaut	129	6.5
Liège	79	4.2
Limbourg	112	6.0
Luxemburg	51	2.7
Namur	78	4.2

Thus Ghent and its neighbourhoud account for more than half the horticultural establishments in the country.

Germany comes first as a consumer of Belgian horticultural produce ; then follow, in order of importance, France, the United States of America, England, Holland, Russia, Austria-Hungary, Switzerland, the Scandinavian countries, etc.

According to certain estimates, the total value of the exports of horticultural plants from Belgium in 1912 was 14 million francs (£550 000) ; in the same year the exportation from Ghent and its neighbourhood alone was over 10 million francs (nearly £400 000).

We way now consider the various species and varieties of plants which figure in this trade. Their number tends to diminish, firstly because amateurs are disappearing in Belgium and in other countries; and secondly because the demands of trade are incompatible with the profitable growing of a large number of different genera.

To supply their customers, the traders require in particular sturdy plants easy to grow, and this in itself explains why the growers limit themselves to a small number of varieties.

One of the dominant plants in Ghent horticulture is *Azalea indica*, of which the Americans are large buyers. The growers endeavour to get good forcing plants, flowering at Easter or Christmas, two seasons during which flowering plants are in great demand in the United States. *Azalea mollis*, *A. pontica* and hybrids of these, which were rather neglected lately, are now coming into fashion again.

After azaleas come varieties of *Rhododendron ponticum*. The varieties grown are those which bud well and easily as small plants, or hardy varieties suitable for the continental climate of Europe or for the sometimes excessive climate of North America.

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(1) In this number are included nurseries for fruit and forest trees, and even small holdings on which market-garden crops are grown. On the other hand some true horticultural concerns do not appear.

Palms and laurels are also very largely grown. Laurels are at present undergoing great changes in shape. Among palms, which are produced in great quantities about Ghent, mention must be made of *Kentia Forsteriana, K. Balmoreana* and species of *Cocos* and *Phoenix.* Other genera are almost given up.

Tuberous begonias (as bulbs) are grown in great quantities, indeed sometimes in excess, as in some years the crop no longer pays. Begonia growing is especially practised by small holders or beginners. The growing of araucarias (*A. excelsa* and *A. glauca*) is also of considerable importance.

Among the other most largely grown plants may be mentioned *Aspidistra, Dracaena, Croton, Maranta,* certain Bromeliaceae and Aroideae, *Citrus sinensis* and various Australian plants. Camellias are coming into favour again. Owing to the commercial conditions already referred to, the number of varieties of these plants is constantly diminishing, while the individual plants are constantly being perfected.

In the establishments round Bruges palms and laurels, and orchids for cut flowers, are specially taken up.

About Brussels, the plants are grown specially to provide cut flowers: lilac is the great feature, and is largely flowered in winter. Sometimes there is a glut, with consequent fall of prices. Lilacs are beginning to be forced growing in the ground on privet stocks. Forcing is also used for roses; the best forcing varieties are: Frau Carl Druchski, Mistress John Laing, Caroline Tertout, Lyon, Mme. Abel Chatenay, Prince of Bulgaria. After lilacs and roses come chrysanthemums, produced chiefly from September to January. Then, still of considerable, though secondary, value, come *Calla aethiopica,* wallflower, lilies, (*Lilium candidum, L. longiflorum, L. speciosum*), gladiolus, ixias, etc., and lastly any quantity of plants grown in the open.

American carnations are taking more and more hold in Belgium. In the international show the Belgian ones were well able to compete with those from other countries.

Among the plants grown in Belgium, special mention should be made of orchids. They are produced about Brussels and Ghent, at Bruges and elsewere. The demand for them keeps on growing; the Belgian production of these cut flowers is at present the largest in Europe. Besides this, amateurs and professionals are engaged in obtaining new varieties from seed and hybridizing; some of those already obtained surpass all imported varieties in beauty and rich colouring.

The slowness of raising orchids in the Belgian climate and the enormous quantity of plants required by the trade necessitate continual fresh importations from their countries of origin. The big firms communicate with collectors exploring the tropical regions of America, Asia, Africa and some parts of Oceania. Early on, Belgium began to organize botanical exploring expeditions with a view to procuring horticultural plants. The first, in 1835, was entrusted by the Government to Lindon; later, Van Houtte became celebrated in this line. At present the chief work of the collectors is to procure and send off large quantities of the known species, especially those suitable for flower-growing on a large scale.

As can be seen from what has been said, Belgian horticultural production tends to become specialized, and as this specialization goes on, another economic phenomenon appears, at any rate with reference to Ghent: this is that while the majority of the firms raise plants, and only exceptionally deal abroad, frequently even not at all, other firms are almost entirely occupied with the export trade, and do very little raising (1).

A new organization of horticultural instruction, considering commercial necessities, will in the future facilitate the relations with other countries and give great encouragement to this part of the work, which will become more and more dominant.

Owing to the specialization in the plants grown, the arrangement of the establisments and the construction and heating of the houses have undergone great changes, constituting decided economic and technical progress. In the old establishments small houses were numerous. as each had to be used for different plants. For some years, most of the houses put up have been large, even up to an acre in area. These buildings offer great advantages for both labour and heating.

The inevitable rise of wages also obliges the growers to economize labour as much as possible, and to devise means for replacing it by mechanical contrivances, at any rate for heavy work, such as watering. The construction of the houses has been simplified and improved; the choice of materials is more careful. Small panes of glass are given up, and only larger ones used. But the question of heating is the one that has most largely occupied the growers, and it continues to do so, as in spite of the experience gained it cannot yet be said that there is a general agreement on all points of the problem. Originally hot-air heating was general, and it is still used by vine-growers and the small horticulturists. In larger concerns steam heating is preferred. This preference is based, especially for the super-heated steam system; on the better drawing of the fire, which allows a cheaper fuel to be used.

Steam heating is, however, not advisable in all cases, especially for cold houses where the heating is intermittent and the temperature must not rise above a certain point. There are plants, such as orchids, which require a fairly moist atmosphere; for these hot-pipe heating is preferred.

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(1) There is in Belgium only a single society which undertakes the sale of the produce of its members; this is the *Syndicat horticole, viticole et maraîcher*, a very prosperous society, which has an auction at Brussels for the public sale of flowers grown by its members, as well as by others.

These remarks would not be complete without mention of some of the means employed to maintain private enterprise, which has been very energetic in the horticultural line in Belgium, and to safeguard the interests of the horticultural industry.

Belgium is with truth said to be the classical ground of societies of all kinds. There are certainly more than 300 societies occupied in some manner with gardening or horticulture. It was one of these societies, the Royal Agricultural and Botanical Society of Ghent (1), which in 1808, as already stated, organized the first known exhibition of plants of flowers. For many years the show organized by the Societies for the Encouragement of Horticulture (Sociétés d'émulation horticole), and more recently the horticultural meetings of Ghent and Brussels, have been a great stimulus to progress, and by spreading the taste for flowers and plants have helped to increase the wealth of the country.

For some time Belgium has had the advantage of horticultural instruction. The foundation of the school at Ghent by Van Houtte in 1849, and almost simultaneously of that at the De Bavay establishment at Vilvorde, marks a considerable advance in the history of Belgian horticulture. At the present time horticultural instruction suitable for labourers is given in all the centres of production.

Belgium possesses a State Botanic Garden, in which horticulturist and amateur can find collections of hothouse and outdoor plants to study.

Since 1880, the defence of the commercial interest has been under the energetic and enlightened guidance of the Belgian Chamber of Horticulture (Chambre syndicale des horticulteurs belges), whose offices are at Ghent.

With the idea of giving to national horticulture an official recognition of its importance, the Government instituted in 1908 a Superior Council of Horticulture, composed of 29 members representing the various branches of the horticultural industry; its mission is to give advice on questions submitted to it by the Governement or by its members.

In the same year, the Government created a service specially designated to study horticultural questions, and in 1911 this service became part of the general administration of the country, with the title of "Horticultural Office". With the assistance of a corps of employees entitled "State horticultural advisers", appointed at the end of 1909, the Horticultural Office has already undertaken work of various kinds, from which good results are to be expected.

Lastly, the Government founded as long ago as 1892, in connection with the State Agricultural Institute at Gembloux, a service of research and consultation on the damage caused to crops by plants and insects. This *general* phytopathological service is at the disposition of public administrations and private persons. By Royal Decrees of the 9th of September 1909 and the 8th of November 1912, this was completed by a *special* service, entrusted with the supervision of the measures taken, both in the interior and on the frontiers, to prevent the spread of plants and insects injurious to crops, especially with regard to the horticultural trade relations with other countries.

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(1) The title of « Royal » was bestowed on the society in 1818 by King William of the Netherlands.

Horse Breeding in Japan

by

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The number of horses in Japan in 1910 was as follows:

Original	Cross	Foreign	Total
1 209 334	341 462	13 847	1 564 643

For every hundred inhabitants there are 3.15 horses, which number is very low, when compared with other countries. The foaling number for 1910 is as follows:

Original	Cross	Foreign	Total
47 095	68 976	1 879	117 950

To improve the breed of Japanese horses the Horse Breeding Administration has been established under the control of the Army Minister to which belong three studs for horse breeding, one rearing farm for foals and 15 stallion depots; 6 Inspectors belonging to the Administration are inspecting the horse breeding of the country. The stallions and mares belonging to the Administration numbered 1 372 in 1910, among which there were 565 foreign (Anglo-Norman, Thorough-bred, etc.), 256 cross stallions, and 551 brood mares. The stallions are distributed among 262 covering stations, and they are placed for the public service between April and July. The fee of 5 to 10 Yen (1) must be paid for the service of superior stallions. The percentage of foaling is 50.

To encourage the improvements of horse breeding the Administration gives premiums and prizes at local shows, races, etc., which expenditure amounted in 1908 to about 630 000 Yen. The castration of foals is also encouraged by giving a premium of 4 Yen for one gelding.

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(1) The Yen is equal to about 2 shillings.

For providing the remounts to the Army there are 10 Remount depots, and about 3 500 yearlings are annually purchased; these are kept there for three years, and then distributed among the regiments.

There are also 11 breeding studs belonging to the local governments and about 250 000 Yen are expended for these establishments.

I. Characteristics of Native Horses.

The breeds of horses native to Japan have but few distinguishing characteristics. Prof. Imoi, however, groups them into four breeds according to form and character; the differences are due to diversity of land-features, climate, food, management, etc. becanse horses are bred throughout Japan proper, from Kyûshû in the South to Hokkaido in the extreme North. The breeds are as follows:

1) The Hokkaido, found throughout Hokkaido.

2) The Nambu, found in the extreme northern part of the Main Island in the Aomori, Iwate aud Akita Prefectures.

3) The Miharu, found mostly in Miyagi, Fukushima and Yamagata Prefectures, south of the above-mentioned region.

4) The Satsuma Breed, found principally in Kagoshima and Miyazaki Prefectures.

1. *The Hokkaido Breed.*— The horses of the Hokkaido breed are small in size. The island is believed to have originally possessed no horse, and it is surmised that the introduction of the horse from the mainland begins the history of the production of this useful animal. Ancient annals, however, tell us that certain Ainu, or aborigines of Hokkaido, made presents of horses as tribute to the authorities of the Main Island as early as 718 A. D., and we may take this as evidence of the existence of the horse at such a remote age. Real progress in horse breeding in Hokkaido begins, however, with the introduction of the Nambu breed into the island towards the end of the 18th Century. Although the Hokkaido breed is the outcome of this introduction, it yet has many peculiarities of its own. The horses of this breed range in height from only 3ft. 8in. up to 4ft. 3in., and they might more appropriately be termed ponies. The small Hokkaido horses are decreasing gradually, being substituted by horses with a considerable infusion of foreign blood.

To describe the native Hokkaido breed in detail, we may say that the typical northern horse has a large heavy head and a long body; the legs are short and clean with well articulated joints and the hoofs are good: the croup is not so narrow and weak as is the case with horses of other breeds found in Japan, which is one of their greatest defects. The horse has likewise well-developed muscles capable of producing quick and easy gait. The horse can easily travel about 25 miles a day carrying a rider weighing about 125 pounds.

The principal horse-producing district in Hokkaido is Hidaka, which is followed by Iburi and Toshima in order of importance. The excellence of the Hokkaido horses as good pacers is due to the vast extent of the land, which renders the use of the animal indispensable for intercourse among the country people.

In recent times, Thoroughbred horses have been introduced to produce valuable race horses; fine specimens of these often attain the height of 5ft. and more.

2. *The Nambu Breed.* — This breed is found typically in Aomori Iwate and Akita; it is the heaviest as well as the strongest horse of the country. This region has long been famous as a horse-producing district, the Persian horse having been introduced some 400 years ago, and other foreign stallions have been brought in more than once. As in other countries, these fine imported breeds have never been admired by the people and they were hardly used for breeding purposes. The total lack of foreign blood in the Nambu horses observable in our days may be ascribed to this fact. At present, however, the introduction of Thoroughbred, Hackney and Anglo-Norman horses is encouraged for the improvement of the native stock.

The Nambu breed is easily distinguished by a large heavy head, a thick low neck and a long slender body. The croup is narrow, short, sloping and not well developed; the legs are short and rather heavy, while the articulation is somewhat weak, the hoofs being large and flat. Owing to the poorly developed muscles, the gait is not very quick or light. The height is from 4ft. 7in. up to 5ft., but fine halfbred horses often measure more than 5ft. 2in. Most of the horses used in the army are of this breed.

3. *The Miharu Breed.* — To this breed belong the horses produced in the greater part of Northern Japan, especially in Miyagi, Fukushima and Yamagata and throughout the country as far as Gifu and Ishikawa in the West. This extensively diffused breed seems to have received Nambu blood in the proximity of Iwate and Akita, as in Miyagi, Yamagata and Fukushima, but the pure Miharu horse has its own clearly-defined characteristics.

The head and neck in the Miharu horse are lighter than in the Nambu breed; the body is somewhat long and small, while the croup is narrow, short and sloping. The legs are not so short as those of the Nambu horse, and rather clean, but the hind legs are always forestanding with consequent poorer articulation of the hock-joints. The hoofs are rather hard and well formed. The horses have good action, since horsemanship has been greatly encouraged from ancient times. The height of the animal is 4ft. 6in. to 4ft. 9in. Horses of this breed are little used in the army compared with the Nambus. In Nagano we find a smaller form of the breed called the Kiso mountain horse, which may be grouped with the Miharu breed.

4. *The Satsuma Breed.* — Satsuma horses are found in the southern provinces of Kyûshû, *viz.* Satsuma, Hyûga and Osumi, where they have been reared from early times. It is stated that under the reign of the Emperor Nara, some five hundred years ago, Arabs were introduced, and

to this fact the superiority of the Satsuma horses may be due. Horsemanship was common in ancient times, and this resulted in the breeding of excellent saddle-horses. In our days, horse racing is in great vogue in this region.

The characteristics of the breed are that both head and neck are well formed; the body and croup is regular, compact and short, while the defect of narrow chest is present. Both fore and hind legs are slender and perfectly clean, while the hoofs leave nothing to be desired. Although the animal has not strongly articulated joints, it has good proportions for a saddle horse. The Satsumas are the best race horses at present, and the average height is 4ft. 8in. Unfortunately the horse is not yet very much used in the army. The breed is widely diffused in Kyûshû, Shikoku, and, in general, in the western part of the Main Island.

II. The Rearing of Horses,

Feeding. — In Japan, horses are fed principally on the wild grasses of the locality, although this practice is somewhat modified in several provinces. In Hokkaido, which is rich in pasture, the animal is set free to graze; in Nambu, Akita, Miyagi and Fukushima, where the land is still comparatively unoccupied, the animal is fed partly in pastures and partly in stables. In the months between November and the May following, the animals are kept in stables, since the ground is covered with snow and no pasture is available. On the contrary, down in Satsuma, where the country is too densely inhabited to leave any ground for pastures, horses are mostly fed under cover by giving them green fodder freshly cut from the neighbouring fields and the ridges between the rice-fields. This is the case also in many other localities.

Hitherto, it has been customary among the farmers who rear horses to let them graze in the pasture in spring and summer and to feed them under cover on coarse hay, beans, millet and sorghum stalks during the winter. Some careful feeders mix a small quantity of bran with the regular diet as a sort of relish. Nowadays, however, most of the horses above medium grade are fed with a small quantity of beans, barley and oats, in addition to hay which was the exclusive diet of former times. Beans are added to the rations of the Nambu horses, oats to that of the Hokkaido ones, while the Kyushu horses get some bran with their other food.

Exercise. — There is no established form of exercise. In Hokkaido, as well as in other districts where there is plenty of land, foals follow their dams when the latter go to neighbouring places with riders and packs on their backs, and this helps greatly to strengthen the young animals. Particularly in Hidaka exercise in the open is possible all the year round, as the snow-fall is little. In Akita and Nambu, where snow lies so many months and there is no place available for exercise in the winter, the poor animals are kept in stables, to the great detriment of their health and strength. Of late, in many provinces valuable horses are exercised in the winter months, though only sparingly. Ordinary mares loaded with fire-wood and charcoal are taken to neighbouring towns and are followed by their foals; but such occasional trips should not be regarded as equivalent to that regular exercise so desirable for the young animals. It may be said that the foals are never sufficiently exercised by the farmers in the north who are engaged in horse raising. Even in districts where there is little or no snowfall, as in Kyûshû, the foals are seldom exercised during the winter months. It is only the valuable animals that are driven or ridden when young in order to give exercise suited to their development.

Breeding. — Covering is generally carried on from April to June, the dams being generally covered by stallions belonging to the State or to private individuals. Now-a-days good stallions are imported from France, England and Hungary, and these foreign races, as well as fine halfbred stallions produced in this country, are placed at the disposal of rearers.

The birth rate comes up to 50 per cent. Mares in foal are generally used for some light sort of field labour; but in the north dams are often fed for the exclusive purpose of breeding, being never worked at all.

III. DIFFERENT USES OF HORSES IN JAPAN.

Hitherto horses have been reared principally for agricultural ends, to do occasional field work and to produce stable manure. In country districts, pack-horses were formerly used for transport, After the Restoration, the demand for army horses on the one hand, and for cart horses on the other, due to the increase of the army and the development of roads, has steadily increased. Since the importance of, and interest in, horse racing are not at all what they are in European countries, the breeding of race-horses has been but little cared for. Only the Koiwai farm, belonging to Baron Iwasaki, is maintained exclusively for the breeding of Throughbreds. Excepting horses bred for army use, we may safely say that the aim is to produce either animals suited for agricultural purposes or pack-horses.

IV. THE IMPORTATION OF FOREIGN STALLIONS AND MARES FOR BREEDING PURPOSES.

Up to 40 years ago, the only imported stallions were American Trotters; but Arabs, Throughbreds and Anglo-Arabs were imported in later years. Quite recently, Hungarians, Anglo-Normans, Hackneys and Throughbreds have been imported. The business is conducted by purchasing committees chosen from among Inspectors of the Horse Breeding Administration, who are sent abroad every year; importations of between 80 and 90 stallions and mares at a time have been made during the last seven years.

V. The Sale of Horses.

Before the Restoration, only foals one or two years old were sold at auction, the control being in the hands of the then existing Feudal Government.

Since the establishment of Horse Breeders' Guilds in late years in different localities, sales have come to be managed by these guilds. Quite recently, after the promulgation of a law with regard to holding Fairs for Domestic Animals in 1910, various fairs have come into existence to undertake the sale of horses, such fairs being classified as Permanent, Periodical and Special, and the number is 1 044, inclusive of those held only for the sale of cattle. According to a Government report of December, 1912, fairs exclusively for horses number 372. Some of these are indeed too insignificant to be designated as fairs, but others are of considerable size and importance, these latter being mostly held by the Horse Breeding Guilds.

In northern Japan two-year-olds are, in general, offered for sale at the fairs. We should add, however, that in Hokkaido it is customary to wait until the age of three is attained, and in Kyushu foals of the first year are put on sale, mostly at the so-called Periodical Autumn Fairs. The owners or breeders of young animals take them to the fair, where they are mostly purchased by horse dealers. Horses for army use are also secured by Government Remount Purchasing Committees on these occasions, the remounts so purchased being taken to the remount depot, where they are properly reared for the service,

For the Government Studs, too, purchase is made of young animals at these fairs fit to be used as State stallions and brood mares; these are kept at the State Foal Yard for two years and then delivered to State stallion depots for the improvement of farm horses.

VI. Horse Shows and Exhibitions.

In many horse-breeding districts, shows are held in each prefecture, and on some occasions combined shows are held for more than one prefecture. In the smallest show in one prefecture the number of exhibits is fifty. The Prefectural Show is held every year or each alternate year for one prefecture; the so-called "Interprefectural Show" is held only once in two years. In general, 3 to 6 year old animals are brought out on the occasion; but in some cases two-year-olds are shown also, fillies as well as colts. The horse shows held during the year 1911 throughout the country numbered twenty-two.

No large exhibition of horses alone is as yet held, but a considerable number of animals are always exhibited at the Industrial Exhibition, which is generally held once every ten years, for the whole country, aud at which selected exhibits are sent from the provinces, great interest being taken therein.

The awards bestowed both at horse shows and exhibitions consist of medals, prizes, and diplomas. In the case of a Prefectural Show prizes range from 200 to 300 Yen, 100 to 150 Yen, and 50 to 100 Yen for 1st, 2nd and 3rd class prizes respectively, and in addition a Medal of Honour is given. At an Interprefectural Show, the first prize is 500 Yen, but at exhibitions only medals of honour or diplomas have been awarded. The judges are always appointed from among Inspectors of the Horse Breeding Administration or Directors of State Studs, and they generally number three for an Interprefectural Show. At an exhibition, experts, distinguished men and others are appointed as judges. The distribution of awards is mostly made by the President of the Horse Breeding Administration in the presence of the Prefect, local officials and the prominent men of the locality.

Points. — The judges give their decision by taking into consideration the points of the animal, little attention being paid to its fitness for certain uses, etc. Trials are made only by riding; hitherto no trial has been made of capacity to jump, or to draw loads.

For the judgment of horses according to the use, or according to the races, no standard has yet been established.

The judges generally first examine the animals separately, after which comparison of the exhibits is made, and then the final awards are given.

Carp-Breeding in Rice Fields in Italy

by

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Breeding carp in rice fields is no novelty, as the Japanese have carried it on for a century and a half with excellent results. But it should be remarked that the conditions of the rice fields in Japan are very different from those prevailing in this country, in that they are mostly permanent and under water the whole year, and may thus be considered as practically ponds. But even in Italy carp-breeding in rice fields has been practised: thus, Sig. Gasch carried it on on the property of Mezzolana, near Bologna, and got very good results; but the breeding was eventually given up for special reasons. It should be noted that the Bolognese rice fields are specially suitable for fish-breeding in being on warp land. It was therefore desirable to make trials in rice fields under the more general conditions of most of the Italian ones, and to arrange that the breeder should not have to undertake any special work and in particular that no changes in the usual method of growing rice should be required. It was further desirable to ascertain the relations between breeding the carp and growing the rice, and whether the latter was in any way damaged. The experiments begun in 1909 immediately gave very promising results; they were continued in the following years on a constantly larger scale, and it may now be said that carpbreeding in rice fields has reached the stage of application in practice.

The merit for this should be given to the Lombardy Agricultural Society; when the experiments had given good results, this body took up the question in an active manner, facilitating the purchase of fry by the rice-growers, undertaking supervision, and carrying out a general propaganda.

The breed of carp adopted for this work is the Galician mirror-carp, characterized by its deep and short body, which gives it a thick-set appearance. It is a selected race which grows rapidly and has a larger proportion of flesh to bone than the ordinary carp. The mirror-carp does well in our rice fields, even if kept for three years; but in rice fields in which for any reason the water is low (much below 8 in.), or may be so under certain circumstances, it would be better either not to grow the fish beyond two years or to use a flatter and longer type, such as the Bohemian carp.

The process of spawning to obtain fry to turn out in the rice fields is very simple. The spawning pond should not be too big; an area of about 10 sq. yds. and a depth of 20 in. is sufficient; the sides should be sloping. The pond is first sown down to grass and then filled with water; bundles of juniper or pine branches are put in for the fish to lay on. When the depth of the water reaches 8 inches the carp may be turned in; there should be at least two males to each female, and they must have been kept previously in cool water and the sexes separated. Spawning takes place usually between May and July. If the conditions of the pond are favourable, the carp spawn within three or four days, laying numerous eggs which are fixed to the aquatic plants or to the bundles of branches.

It may be reckoned that a female weighing 2 ¼ lbs gives an average of 100 000 eggs, but a heavier carp may give 250 000 or even more. The eggs develop more or less rapidly according to the temperature, but 10 to 12 days may be taken as the usual time for hatching. In this way plenty of fry can be had for the rice fields; the number turned in should be from 800 to 1600 per acre, according to conditions. Anyone not wishing to undertake the breeding of fry can easily purchase them; the present price is about 6 lire (4*s* 6*d*) per thousand.

The only special provision required is to fit the inlets and outlets of the field with wire netting, to prevent fish getting in from outside and the fry escaping. This, of course, should be done before the water is let in.

When turned into the rice field the fry weigh about 30 mgm. each (*i. e.* about 1000 to the ounce); as the conditions are excellent, as regard both food and temperature, they very soon reach a moderate size; observations so far show that at the rice-harvest, three months after the fry have been turned in, fish weighing 100 to 200 gms. (3 ½ to 7 oz.) can be found.

The presence of the carp in the field in no way hinders the usual cultivation operations of the rice, such as weeding and drying-off. The first can be done without any attention being paid to the fish; for the second, the fish must be taken out when the water is drawn off, and put into some ditch or temporary basin; afterwards they go back to the field again. When they are taken out again at the harvest they can be put into a pond or tank for the winter. As they are more or less torpid in winter, and require hardly any food, they may be kept in a fairly limited space, and even not fed. A tank of 3 ft. cube will hold about 85 lbs. of fish. The following summer the carp can be turned into the rice field again when the young plants are firmly rooted; about 80 should go to the acre. At harvest-time each fish may weigh 2 lbs. or more. Of course the number will depend on how many were turned in, but the individual weight will be greater if they are fewer. The carp may be put into the rice fields for a third summer, in which case they reach nearly 5 lbs. in weight; but it is generally not advisable to keep them beyond the third year, as firstly they are too big for the comparatively shallow water, and secondly the increase in weight is small compared to the amount of food they take.

It is thus seen that after the second summer fair-sized carp, already marketable, can be obtained, so that anyone wishing to reduce the trouble can purchase young carp in the spring; these weigh 15 to 20 gms. (½ to ¾ oz.), and at harvest-time run to 600 or 700 gms. (1¼ to 1 ½ lbs.). Thus a fair yield could be got in three months. The experiments so far made indicate that an acre of rice field may yield 90 lbs. of carp.

The presence of the carp is not only not harmful, but actually beneficial to the rice crop. In many cases it has been found that the crop in fields containing fish is cleaner, so that the second weeding is not required; in a few cases, also, the fields with fish in them have given a heavier crop of rice than those without. This is not to be wondered at, when it is remembered that carp eat many insects, molluscs and other animals which damage the rice.

The experiments are not yet sufficiently numerous to make this point certain, but there is no doubt that the crop is in no way harmed by the fish.

The flavour of the carp is generally very good, even when they are freshly taken from the rice field; but if they have a muddy taste, this can be readily got rid of by keeping them a few days in perforated barrels in running water. Carp are so unexacting that they can easily be kept till a convenient time for selling them; the demand for them is generally very good.

During the earlier years of the experiments the requests for fry from rice-growers were very few; but now they are comparatively numerous, and come from various parts of Italy besides Lombardy. The growers have seen the good results, and are taking up carp-breeding widely; they are trying hatching for themselves and endeavouring in every way to make this industry practicable and profitable. All the same, much remains to be done.

There are in Italy 367 040 acres of rice fields, of which nearly all could be used for carp breeding; this means that the value of such fish might be hundreds of thousands of pounds; and this could be obtained without in any way interfering with the rice crop, which indeed would be rather benefited. Carp is thus an extra product which can be obtained with very limited expense and trouble on the part of the rice-grower; the fish crop could be used for home consumption or as material for a small industry. Now that the difficulty of getting cheap food is becoming steadily greater in both town and country, it would be very useful to have a supply of good, wholesome fish at a low price. The small renting farmer might have a tank from which he could get fish whenever he wanted it; this would at any rate serve to improve and vary his generally meagre fare; the city markets could have good fish at low prices, to be sold alive so that it would be guaranteed fresh to the purchaser; thus even the poorer classes could easily obtain a wholesome and nutritions food. Besides this, carp could be used, at any rate as a subsidiary means, in the control of malaria; since they feed on the eggs and larvae of mosquitoes, spreading them in the rice fields in malarial zones ought to facilitate the task of combating this pest, which is not yet dealt with.

Last year another fish, the trout-perch, was tried in rice fields; it does not reach the same size as the carp, but its flesh is of much better quality, This shows that various fish may be grown in rice fields, but there is no doubt that carp are the most suitable for this purpose and give the best results (1).

A Study on Milk and Cheeses in Greece, with regard to their Chemical Composition

by

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In the laboratories of agricultural chemistry at the Ministry of National Economy, investigations are being made into the products of stock breeding and agriculture of the country, especially as to their chemical composition, which is of great importance for the improvement of these products, as well as from the economic and administrative point of view (discovery of and prosecution for frauds). The principal task of one of these laboratories is the determination of the chemical composition of milk and cheeses.

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(1) For further particulars on the methods of breeding carp, see: SUPINO, *La carpicultura nelle risaie, cenni biologici e pratici.* Milan, Società Agraria di Lombardia, 1913.

The figures given in this article are taken from observations extending over two years; during this period it has been possible to consider all the different cases and conditions of sale of these products, and all the samples have been taken under our own direct control, or under the control of an experienced and trustworthy person.

I. MILK.

Milk stock and conditions of milk production.

A. *Cows.* — The number of cows kept specially to produce milk for the towns is relatively very small; it amounts to about 3500, of which about 2500 are in the sheds of Athens and its neighbourhood, the remainder being in a few other large centres.

Almost all these cows come from abroad, especially from Switzerland and Russia, a very few come from Holland, and a very few are also bred in the country, but always out of cows obtained from abroad. They are kept always in the sheds and fed intensively, and give 450 to 650 gallons of milk a year.

There are also indigenous cows, but these are never milked; they are small and live almost entirely on the pastures, very rarely getting any additional food. They do some light work, but they are kept almost entirely to breed working oxen for the peasants.

Here and there in the islands of the Archipelago (Naxos, Tinos, Andros) some rather larger cows are found; these are milked, and the milk is used for making butter and cheese. They yield up to 130 gallons a year. These animals, though generally kept at pasture, get some extra food, and are better looked after than the majority of the cattle in other parts of Greece.

B. *Sheep.* — In Greece the only widespread breed of sheep is the "Vlachica", which numbers about four million head. They are small and very hardy animals, living as migratory flocks, in summer on the mountains and in winter on the plains; they never get any extra food and receive practically no shelter against the weather. The ewes rarely drop twins; they milk for five or six months, giving 300 or 400 grams (11 to 14 oz.) a day.

In the islands of Crete, Scopellos, Zante and Chios there are rather larger sheep of a better breed than those living in the rest of Greece; they are known by the names of the islands from which they come: Cretica, Scopellitica, Zakintina, Chiotica. They are generally kept tethered and get extra food in the shed. Most of the ewes drop two lambs, and in the Scopellitica race four is not rare. The milk yield varies according to the treatment; it often reaches 2 to 5 pints, especially in the first three months after lambing,

C. *Goats.* — There are about three million goats in Greece; the indigenous breed, known as the mountain breed from the regions where it belongs, gives little milk; these goats live always in the open and never get any extra food. They drop one or two kids, and yield 400 to 500 grams (14 to 18 oz.) of milk a day for five or six months.

Besides this mountain breed, there are a large number of Maltese goats, which are kept tethered. There are one or two at each house, and with plenty of food and proper attention they give 3 to 5 pints a day. They are rarely kept as herds, and in this case the owners are graziers, who sell the fresh milk; the sheds and pastures are generally round the large towns, and each day the goats are taken into the town and milked in view of the customers. In Greece, in fact, the fresh ewes' and goats' milk sold in the towns comes from the animals kept near by, while the milk of the large flocks and herds on the mountains is only used for making cheese and buttter.

TABLE I.

Fat content of the milk of 285 cows sampled in the various stables in Athens.

Percentage of fat	No. of cows
3.1–3.5	4
3.6–4.0	47
4.1–4.5	113
4.6–5.0	70
5.1–5.5	29
5.6–6.0	15
6.1–6.5	5
6.6–7.0	2

The samples were taken from cows in full milk, without any account being taken of the breed or of the date of calving; all had, however, calved at least a fortnight before. It should be remarked that in the two last groups, with fat over 6 per cent., the cows, though second-calvers, were only giving 4½ to 5 quarts a day.

TABLE II.

Chemical composition of mixtures of cows' milk.

Breed		Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
12 Swiss	Maximum	1.0320	14.08	5.30	3.63	4.95	0.78	88.04
	Average	1.0309	12.72	4.14	3.33	4.48	0.76	87.28
	Minimum	1.0285	11.96	3.55	2.94	4.21	0.73	85.92
25 Swiss	Maximum	1.0320	13.53	5.05	3.63	4.68	0.79	88.05
	Average	1.0305	12.59	4.15	3.21	4.47	0.76	87.41
	Minimum	1.0285	11.95	3.45	2.79	4.14	0.74	86.47
16 Swiss	Maximum	1.0325	14.17	5.15	3.98	4.62	0.81	87.78
	Average	1.0312	12.92	4.32	3.41	4.41	0.78	87.08
	Minimum	1.0295	12.22	3.95	2.67	4.14	0.75	85.83
8 Russian	Maximum	1.0320	13.67	5.18	3.45	4.81	0.79	87.55
	Average	1.0310	12.96	4.41	3.26	4.54	0.76	87.03
	Minimum	1.0290	12.45	4.00	2.83	4.21	0.73	86.33
7 Russian	Maximum	1.0310	13.76	5.35	3.66	4.68	0.81	87.59
	Average	1.0299	13.06	4.70	3.21	4.38	0.76	86.94
	Minimum	1.0270	12.41	3.90	2.85	3.87	0.74	86.24

N. B. — In these different cases analyses were made each week for a year; in some of the stables cows were removed and replaced by others during this time, but the total number remained the same.

TABLE III.

Fat content of cow's milk at different times during milking.

First half litre	1.4 per cent
After the fifth litre	3.1 » »
Last half litre	7.6 » «
Average of the ten litres	4.7 » »

[One litre = 1 ¾ pint; 10 litres = 2 ⅛ gallons].

The milk of a cow which had just calved contained 1.8 per cent. of fat; a fortnight later it was up to 4 per cent., and then remained constant except for slight variations due to the lactation period or the season.

TABLE IV.

Chemical composition of milk from a flock of 400 Vlachica ewes.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0370	19.32	8.08	6.59	4.56	0.94	82.10
Average.	1.0358	18.45	7.11	6.24	4.19	0.92	81.55
Minimum	1.0332	17.90	6.05	5.82	3.98	0.90	80.68

TABLE V.

Chemical composition of milk from a herd of 300 mountain goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0320	16.67	7.12	4.49	4.24	0.82	85.97
Average.	1.0305	15.22	6.11	4.20	4.12	0.80	83.77
Minimum	1.0300	14.03	5.22	3.95	3.95	0.79	83.33

The analyses given in Tables IV and V were made weekly for six months.

TABLE VI.

Chemical composition of the milk of Maltese goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0326	16.59	6.80	4.81	4.54	0.88	88.34
Average.	1.0303	13.79	4.91	3.80	4.27	0.81	86.21
Minimum , ...	1.0270	11.66	3.68	2.05	3.83	0.74	83.41

The samples for the analyses shown in Table VI were taken at random from goats brought round the streets for the sale of milk. This explains the great range in the figures, which represent 125 analyses made over a period of two years.

II. MILK FRAUDS.

The chief frauds practised are watering and skimming; the use of various substances to improve the keeping qualities of the milk is little known in Greece.

III. CHEESES.

The cheeses of Greece may be ranged in two great classes: soft and hard. They are made only from ewes' and goats' milk, and are almost entirely consumed in the country. In 1910 the Royal Agricultural Society of Greece organized a cheese show in Athens; most of the provinces took part in this by sending the different types of cheeses made in their districts. We took advantage of the occasion to obtain samples for analysis of nearly all the cheeses.

The results of these analyses, with some others made later, are shown in Table VII.

TABLE VII.

Chemical composition of the principal Greek cheeses.

Type	Name	Water %	Ash %	Fat %	Nitrogenous matter %	Salt %
Soft	Têta	46.206	6.736	26.464	20.594	4.490
»	»	45.475	6.476	27.280	20.769	4.386
»	»	45.289	5.279	30.048	19.384	3.012
»	»	44.180	5.035	32.679	18.106	2.715
»	»	48.121	5.822	27.399	18.658	3.737
»	»	51.751	5.702	24.567	17.980	3.796
»	Touloumotyri	45.835	5.148	29.173	19.844	2.795
»	»	37.107	5.469	31.694	25.730	3.254
Hard	Kephalotyri	26.104	6.223	29.556	38.117	2.776
»	»	26.318	9.869	28.964	34.849	6.913
»	»	32.193	10.185	28.567	29.055	5.963
»	»	30.024	8.327	27.419	34.230	5.035
»	»	25.588	8.018	36.288	30.106	5.393
»	»	25.835	9.308	28.527	36.330	6.709
»	»	27.641	7.154	25.316	39.889	3.888
»	»	20.066	6.085	39.618	34.231	3.407
»	»	38.427	7.601	25.158	28.814	3.959
»	De Kritis	38.745	7.600	20.313	33.342	4.430
»	»	33.341	7.555	28.295	31.809	4.271
»	»	37.517	6.980	23.618	31.885	3.939
»	Agraphon	34.124	6.582	30.992	28.302	3.894
»	»	28.398	6.165	36.561	28.881	3.317
»	»	30.329	6.520	33.403	29.748	3.522
»	»	29.934	9.314	30.202	30.550	6.005
»	Dutch	33.648	7.395	32.193	26.764	4.246
»	Kasseri	34.518	5.527	20.936	39.019	2.462
»	»	35.216	5.776	24.934	34.074	3.043
»	»	34.540	5.605	20.074	39.781	2.701
»	»	28.978	7.799	33.590	29.633	5.202
»	St. George	28.527	4.325	36.509	36.639	0.888
»	Skyros	22.139	6.031	38.161	33.669	3.172
»	Kassavetie	22.428	5.352	37.555	34.665	2.236

The Present State of the Potato-Drying Industry in Germany

by

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The most important of all the hoed crops is the potato. As a human food, a feeding-stuff and a raw material for technical operations (starch manufacture and distilling) it is of the greatest consequence. Germany's potato crop occupies 8.1 million acres, that is over 12 per cent. of the total cultivated area. All the other hoed crops together only amount to 4 per cent. The yearly production of potatoes in Germany has reached 44 ½ milion tons. The consumption is about 40 million tons; of this about 13 million goes for human consumption, 16 million for cattle food, 4 ½ million for industrial purposes and 6 ½ million for seed. The difference between production and consumption is 4 ½ million tons; this forms the loss, which is due partly to natural respiration during storage, and partly to rotting. The 4 ½ million tons of potatoes used in industry are distributed as follows: 2 ½ million for distillation, 1 ½ million for starch-production, and half a million for drying. The annual loss of potatoes is at present equal to the amount used in industry.

With but few exceptions the potato crop has steadily increased, rising from 25 million tons in 1887 to nearly 50 million in 1912. The yield per acre has in the same period risen from 3 tons 6 cwt. to 5 tons 9 cwt., while the yield per head of population has increased from about 10 cwt. to about 14 cwt. A still further increase of the potato yield is to be anticipated for certain from further improvements in cultivation. The consumption of potatoes has not kept pace with the production.

Potato-drying should therefore establish an equilibrium between the two and at the same time reduce the yearly loss. The following statistics show how well suited potato-drying is for these purposes. In 1907, 118 factories dealt with 125 000 tons of potatoes and produced 30 000 tons of the dried material. In 1912 there were 426 factories, which used 550 000 tons and turned out 120 000 tons of dried potatoes. Thus in five years the number of potato-drying factories has increased three and a half times, while the material dealt with has increased four and a half times. The potentiality of the existing factories is, however, much greater; with a complete utilization of their apparatus, they could take 1 ½ million tons of potatoes, making 400 000 tons of dried potatoes. So far the disposal of the produce has presented no difficulty. With a view to maintaining favourable conditions of the market, keeping prices steady and increasing the area of disposal, the Society of German Potato-driers has arranged an economic understanding; this result has been reached by the formation of the Sales-Union of German Potato-driers, to which most of the factories belong.

The technical development of potato-drying has in a short time reached a high degree of perfection. The German machine-industry has worked so persistently at the construction of the driers, that the dried potatoes now turned out by them are of unsurpassable quality. The firms which have done most in this direction are: J. Aders, of Magdeburg; Büttner, of Uerdingen; Förster and Co., of Magdeburg; Imperial, at Meissen (Saxony); Kletsch, of Coswig near Dresden; H. Paucksch A. G., at Landsberg a. W.; the "Tätosin" Drying-machine Company, of Berlin; Venuleth and Ellenberger, of Darmstadt; and Wagner, of Cüstrin.

The drying machines used at present are on two different principles: drums and rollers. Both are widespread, but the roller-system tends to preponderate. The two systems differ in the source of the heat and in the form of the product. In the drums, the drying is carried out by gas from coke, lignite or coal, mixed with air, while the roller-apparatus uses steam or superheated oil. The drum-apparatus turns out potato slices, the roller-apparatus flakes. The drum-system is represented among others by the firms Büttner, Imperial and Wagner.

Büttner's apparatus consists of a fluted drum, in which the potato-slices, prepared from washed potatoes by a special machine by the same maker, are slowly turned over. The hot gases from the furnace are drawn into the drum by an aspirator, and come into contact with the slices, from which they draw off the moisture; this escapes from the drum through the " Cyklon ", while the dried potato slices pass out at the far end of the cylinder; after passing through a refrigerator they are ready for packing.

The Imperial drying-apparatus consists of a trough in which revolves a cylinder with perforated casing; the outer surface of this casing is provided with pins, which carry the slices from the trough over the drum where they come in contact with the hot gases streaming through it. The gas is led into the drum through a tube. The dried slices are carried to the store by an air current.

Wagner's drum-apparatus (v. Schütz system) is composed of first and second driers. Each drier consists of four enclosed superimposed drums, in which cylindrical stirrers keep in motion the material to be dried. The oven in which the hot gas is prepared is situated between the two driers and communicates with a chamber provided with valves, in which the gas is mixed with air before being led into the drum. Another of Wagner's machines is the simplex drier, which has five fixed superimposed drums. It is suited for small concerns (about 8 cwt. per hour). The cooling of the dried product is performed by a special machine. The transference of the material to both driers and to the cooler is done by elevators.

Besides the machines mentioned, drum driers are built by the following firms; Bernburg Machine-Works, at Bernburg; Jalm, of Arnswalde; Petry and Hecking, of Dortmund; Sauerbrey, of Stassfurt; and Soest and Co., of Düsseldorf. The improvements in construction refer chiefly to special methods of conducting the hot air to and from the apparatus; in this way the consumption of coke has been reduced from 16 or 18 lbs. to 10 lbs. per 100 lbs. of potatoes.

The roller machines have undergone an essential modification. The first of these consisted of two hollow revolving cylinders, placed close together, and heated by steam at a pressure of three or four atmospheres. The washed and steamed potatoes were brought into the rollers by a distributor; they were then crushed between the rollers, forming sheets of paste of the thickness of paper; these were then scraped off, after making three-quarters of a revolution, by knife-blades against the rollers. The steam was drawn off by aspirators close to the rollers.

Nowadays the rollers are no longer put close together, nor are the aspirators near the rollers; but the speed of the rollers and the steam pressure are increased. With appropriate arrangement of the carrying and crushing cylinders, and increase of the steam pressure from 3 or 4 to 5 or 6 atmospheres and of the number of revolutions from 3 or 4 to 6 per minute, a greater capacity of production has been obtained. At present every square foot of surface of the rollers allows of the drying of 14 to 16 lbs. of potatoes instead of 10 to 12 lbs. The roller-machines built by Paucksch are, in the modern construction, provided with crushing rollers, allowing the drying rollers to be further apart. In this way also the heavy pressure of the rollers against one another is avoided, so that the wear is reduced. By the use of the crushing rollers, the thickness of the layer of potato on the drying rollers can also be increased, so that the production is greater and there is no likelihood of getting an over-dried article. The use of powerful ventilators, rendering a chimney unnecessary, allows all the machines to work separately, as they are arranged so as to absorb the steam from above and below the rollers.

The apparatus built by Förster and Co. is noteworthy for having its two rollers very far apart (10 inches). By this arrangement damage to the rollers by stones or other hard substances is almost impossible, and the wear on the rollers and knives is very slight. The potato-mass is brought into the drying-rollers by guiding-rollers.

The roller-apparatus of J. Aders differs from most others in the arrangement for bringing the material into the rollers. Here the potato-mass is placed below the rollers, whereas in all the others (except Förster's machine) it is placed above; in consequence, the rollers of these two machines turn in the opposite direction from those of the others, namely outwards instead of inwards.

With the exception of Kletsch's apparatus, all the roller-driers use steam. Kletsch's rollers are heated by mineral oil at 230-240° C.; the oil is heated to about 240° in a special oven, and led through the cylinders and back to the oven by pumps; the loss of temperature of the oil during the whole circuit is only about 3° C. The same oil is used again and again, and the loss in a season's working is reckoned at only 10 per cent. The oil requirement of each machine is about 10 cwt. In spite of the high temperature, no burning of the dried material takes place, as the rollers make 6 or 7 revolutions per minute. The use of hot oil for heating the rollers allows the apparatus to be run by electricity, thus avoiding all use of steam and boilers except just for steaming the potatoes. The oil is heated by hot gases from the combustion of coke, which pass round a boiler containing the oil. To utilize the escaping hot gas, an Imperial machine is combined with the Kletsch roller-machine in such a way that the gases pass into the Imperial slicing machine, where they are used to draw off the moisture from the potato-slices.

The improvement of the roller-apparatus, the use of hot-water pumps to return the water condensing in the rollers to the boiler, the improved absorption of the steam from the potatoes, etc., have resulted in a diminution of the steam used taking place at the same time as the increase in the working-power of the machines. Whereas formerly 100 to 120 lbs. of steam were required per 100 lbs. of potatoes, the present requirement is only 60 to 80 lbs. The total costs of desiccation have therefore diminished, though they must still be considered high. The reasons for this are: higher wages of labour. higher prices of coal, and the cost of the now unavoidable storage of the dried potatoes. The total cost varies between 3¾*d* and 5½*d* per 100 lbs. of raw potatoes.

Hand in hand with the improvement of the apparatus has gone an improvement in the quality of the dried potatoes. While formely the dried ware was turned out not always free from objection (too damp, burnt, etc.), the present products are of remarkably good character. These are therefore used not only as stock feed, but as human food and raw material for industries; their chief use is, however, for cattle, and in this way they are of great importance. Numerous feeding experiments have shown both slices and flakes to be sound concentrated foods, relished by all classes of stock. For fattening pigs flakes have been found better than slices.

In distilleries and yeast-factories good results have been obtained from the use of dried potatoes, which seem inclined to replace maize. Both slices and flakes can be used for preparing lactic acid, and their yield is at least equal to that of maize. For making gums, dried potatoes in the form of meal have also been found suitable.

Dried potatoes in the form of meal (called "Kartoffelwalzmehl" or "Flockenmehl") are now much used in the kitchen and by bakers and confectioners. For preparing soups and moulds "Kartoffelwalzenmehl" is very valuable, making them tasty and readily digestible. In bake-houses and confectioneries the "Flockenmehl" can replace 10 or 20 per cent. of wheat flour; the produce tastes well and keeps longer than it otherwise would. The use of "Flockenmehl" facilitates the working without increasing the cost.

In the ten years of its existence potato-drying has made great technical and economic progress, and its importance to the nation is now generally recognized.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1015 - **An Act to Regulate the Size and Description of Cases used in the Sale and Export of Fruit and for purposes incidental thereto. Queensland.**

This Act may be cited as "The Fruit Cases Act of 1912", and came into force on July 1st 1913. It prohibits the sale in Queensland, and the export thence to any place within the Commonwealth, of any fruit which is not packed in a case of the prescribed size, measurement and capacity. All cases used for fruit-packing must be new, or clean and free from any insect or fungus disease. All cases used for export must be new. No person shall sell fruit in a case in Queensland, or export fruit in a case until such a case has been visibly and durably impressed, printed, or marked at one end on the outside within a space measuring not more than five inches long and two inches wide:

a) with the name and address of the packer of the case; and

b) with the words "Guaranteed by the packer to contain two imperial bushels", or "Guaranteed by packer to contain one imperial bushel" or one-half or one-quarter of a bushel as the size of such case may warrant.

Any person who does not comply with these regulations shall be liable to a penalty not exceeding five pounds for the first offence, and of not less than two pounds, or exceeding fifty pounds, for every subsequent offence.

Any person who:

a) alters the size of, or tampers with, any case bearing the packer's name, address and guarantee; or

b) wilfully defaces, or alters, or tampers with the packer's name, address, or guarantee on any case; or

c) sells fruit in an unclean case, or in a case infected with either insect, or fungus disease;

shall be liable to a penalty not exceeding ten pounds, or to be imprisoned for any period not exceeding six months.

1016 - **Decree and Order relating to Agricultural Instruction under the Departments and Communes in France.** — Décret et Arrêté portant Règlement d'administration publique pour l'exécution de la Loi du 21 août 1912 relative à l'Enseignement Départemental et Communal de l'Agriculture. — *Journal Officiel de la République Française*, Year XIV, No. 165, pp. 5279-5281. Paris, June 20, 1913.

The reorganization of the agricultural services and agricultural education, laid down in article 1 of the law of the 21st of August 1912 (1), has been regulated by the Order of the 17th of June 1913 and the Decree of the 12th of June 1913.

The dissemination of the agricultural information possessed by the departmental (2) directing offices of the agricultural services is to be carried out by means of lectures and publications. The lectures are given by the directors of the agricultural service and by the professors of agriculture. A ministerial order, made on the proposition of the departmental director of the agricultural services and after consultation with the agricultural inspection service, fixes each year for each department the conditions under which the dissemination of agricultural information is to be carried out. This order, in particular, fixes the number and programme of the lectures to be given during the course of the year.

The publications may consist of bills containing instructions and advice for agricultural practice, to be signed by the prefect; also of leaflets and notices for distribution in the communes under the direction of the mayors and of the presidents of agricultural associations and syndicates in receipt of grants from the State or the department.

The establishments for public instruction in which the agricultural instruction is part of the functions of the directing offices of the agricultural services are indicated for each department by ministerial order. In establishments for public instruction not under the Ministry of Agriculture, the agricultural instruction is given by the director of the agricultural services, the professor of agriculture assisting in the directing offices, and the other professors of agriculture, under conditions fixed by an order made conjointly by the Minister of Agriculture and the Minister responsible for the establishment in which the agricultural instruction is given.

The director of the agricultural services assists, in the department, in the working of the service of economic and social interests of agriculture, mutuality and rural hygiene. For this purpose, all demands for grants from the funds of the State or department coming from societies, mutual agricultural associations, breeding syndicates, cooperative credit banks and various agricultural bodies are submitted by the perfect to the director, who advises as to the suitability of the case. The programmes of all subventioned agricultural shows must also be approved by him. He must also undertake enquiries for the creation of chairs of agriculture and the areas under their charge, and for starting practical schools, farm-schools, winter agricultural schools, house-keeping schools or other institutions for technical agricultural education. He also makes enquiries with regard to demands for advances of money made under the laws on agricultural mutuality, credit and cooperation. He is an *ex officio* member of the departmental committees for awarding prizes for silkworm rearing, olive growing and industrial crops, as well as of the committees for agricultural and viticultural studies, and of the committees of herdbooks, studbooks and other genealogical books for breeds of live stock. He may undertake the functions of general commissioner of the shows organized by the State. He may be entrusted by the prefect with investigations on questions of rural hygiene, and may be called on to assist commissions concerning agriculture.

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(1) See No. 1594, *B.* Dec. 1912.

(2) In this article "departmental" and "department" refer to the administrative divisions ("départements") of France. (*Ed.*).

The director of the agricultural services takes part in agricultural investigations; he is also given the direction of the experimental and demonstration fields for agriculture and vine-growing.

Each year the director of the agricultural services presents to the prefect a report on all the agricultural services of the department.

The director, head of the agricultural services in his department, is assisted by one or more professors of agriculture, who fill the chairs corresponding to the districts determined (by ministerial order), and by professors for special subjects (dairy industry, horticulture, bee-keeping, silkworm-rearing, etc.).

The holder of the chair of agriculture in the town in which the directing-office of the agricultural services is situated acts as and bears the title of assistant to the director of the agricultural services (1).

The professors of agriculture, under the control of the director of the agricultural services of their department, are entrusted with the spreading of agricultural information: 1) by lectures to farmers; 2) by regular courses in the establishments for public instruction designated by ministerial order.

The professors of agriculture are, in their respective districts, to assist in investigations, agricultural statistics and commissariat supply, organization and oversight of experimental fields and agricultural demonstrations, organization of shows, and the creation and control of various societies, and in general to carry out all missions and work entrusted to them by the director of the agricultural services. They are consulted on questions of agricultural education or the agricultural service concerning their districts.

Lecturers in the practical schools of agriculture may, at the same time, undertake the duties of professor of agriculture in the district in which the school is situated.

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(1) "Adjoint à la direction des services agricoles". (*Ed*).

DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES

1017 - **The Most Important Products of the German Colonies.** — THIELE in *Archiv der Deutschen Landwirtschaftsrats*, Year 37 (Report of the Transactions of the 41st General Meeting of the German Council of Agriculture from the 11th to the 14th of February 1913), pp. 211-222. Berlin, 1913.

In the year 1911 the German Colonies produced 3 520 000 lbs. of cotton against 2 420 000 lbs. in the preceding year. The 1912 cotton crop is valued at 6 050 000 lbs. Of this quantity by far the greatest portion is supplied by German East Africa, while Togo contributes but little to the exports.

The cultivation of sisal hemp has developed largely in German East Africa, so much so that in 1911 this colony was able to export 11035 tons of sisal worth £220 500.

The breeding of sheep for their wool is constantly increasing in importance in German South-West Africa; the flocks aggregate about 32 000 head and the exports of wool amount to 187 000 lbs.

Kapok also is on the increase in the German colonies. The production of silk, especially in Kiautschau where close on 30 000 mulberry trees have been planted, is likewise increasing.

As for rubber, a number of planters in German East Africa have associated for working up their crude rubber on cooperative lines. In 1911 the German South Sea Islands became rubber producing countries: Samoa exported in that year £637 worth of rubber, and New Guinea upwards of 4400 lbs. of guttapercha.

The value of the total exports from the German colonies of oils, fats and produce yielding them amounted to about £1 078 000.

The South Sea Islands are actively engaged in the production of copra, of which they exported in 1910 11 000 tons, worth £171 500. The same year German East Africa exported about 5040 tons of copra, worth £98 000. In 1911 the total value of copra exports amounted to £450 800. German West Africa supplies chiefly the fruits of the oil palms and exported in 1911 nearly £400 000 worth of palm oil and kernels.

In 1911 German South-West Africa produced 1 194 000 lbs, of coffee, worth £12 250.

Tobacco is grown in large quantities in Kamerun and in South-West Africa. Maize is produced in all the colonies, but most of it is consumed on the spot. The cacao produced in the German colonies represents one fifth of the total imports of cacao into Germany.

Among the fruits grown in the colonies, bananas and pineapples deserve to be mentioned.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

1018 - **Agricultural Education and Research in England and Wales** (1) — *Board of Agriculture and Fisheries*, Leaflet No. 197, 16 pp. London June, 1913.

The Board have since 1888 made grants which now amount to £18 500 per annum in aid of the higher agricultural education in England and Wales, and grants amounting to £7000 for agricultural education of a less advanced character in most of the counties. Besides the above, grants are also available from the Development Fund for the further extension of education of this type.

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(1) See No. 452, *B.* May 1913. (*Ed.*).

England and Wales possess 14 agricultural colleges and agricultural departments of Universities or University Colleges, which after a three or four years' course give the degree of *B. Sc.* in agriculture or the diploma of agriculture. These are the agricultural departments of the following: 1) University College of Wales, Aberystwith; 2) University College of North Wales, Bangor; 3) Cambridge University; 4) University of Leeds; 5) Armstrong College, Newcastle-upon-Tyne; 6) University of Oxford; 7) University College, Reading; then the following Agricultural Colleges: 1) Royal Agricultural College, Cirencester; 2) College of Agriculture and Horticulture, Holmes Chapel, Cheshire; 3) Midland Agricultural and Dairy College, Kingston, Derby; 4) Harper-Adams Agricultural College, Newport, Salop; 5) Horticultural College, Swanley, Kent; 6) Agricultural and Horticultural College, Uckfield, Sussex; 7) South-Eastern Agricultural College, Wye, Kent.

All the above institutes have farms attached for practical and research work, and many of them besides the usual course of studies hold special courses of shorter duration.

There are also four special institutions: 1) The British Dairy Institute, Reading; 2) Harris Institute, Preston; 3) National Fruit and Cider Institute, Long Ashton near Bristol; 4) Royal Horticultural Society's School, Wisley, Surrey.

There are further twelve farm and dairy schools and similar institutions founded and provided for by the county councils.

As regards agricultural research a sum of £31 000 per annum is allocated from the Development Fund for the purpose of aiding research into certain definite groups of subjects.

The institutions and the subjects selected are as follows:

Subject	*Name of Institution*
Plant Physiology	Imperial College of Science.
» Breeding	Cambridge University. John Innes Institution.
» Pathology	Royal Botanic Gardens, Kew.
Fruit Growing, including the pratical treatment of plant diseases	Bristol University, in conjunction with the National Fruit and Cider Institute.
Plant Nutrition and Soil Problems	Rothamsted Experimental Station.
Animal Nutrition	Cambridge University. Leeds University.
Animal Pathology	Royal Veterinary College. Board's Veterinary Laboratory, Alperton, Middlesex.
Dairying	University College, Reading.
Agricultural Zoology, with special reference to Economic Entomology	Manchester University.
Agricultural Zoology, with special reference to Helminthology	Birmingham University.
Economics of Agriculture	Oxford University.

A sum of £3000 per annum has also been allotted to provide assistance in respect of special investigations for which provision is not otherwise made.

Another direction in which agricultural education and research is being developed is in the supply of technical advice to farmers and the investigation of local problems. A grant of £12000 has been made for this object.

England and Wales have been divided into eight districts in each of which is situated an Agricultural Department of a University or an Agricultural College, the scientific and technical staffs of which devote themselves to the investigations of difficulties and problems presented especially by small holders.

The Institutions selected up to the present and the areas in which the services of the staffs are available are as follows:

Institution.	*Area.*
Cambridge University	Bedford, Cambridge, Essex, Herts, Hunts, Lincs. (Kesteven), Lincs. (Holland), Norfolk, Northampton, Suffolk.
Bristol University	Gloucester, Hereford, Somerset, Wilts, Worcester.
Reading University College	Berks, Bucks, Dorset, Hants, Middlesex, Oxford.
Bangor University College	Anglesey, Carnarvon, Denbigh, Flint.
Aberystwyth College	Brecknock, Cardigan, Carmarthen, Glamorgan, Merioneth, Monmouth, Montgomery, Pembroke, Radnor.
Newcastle, Armstrong College	Cumberland, Durham, Northumberland, Westmoreland.
Leeds University	Yorkshire.
South-Eastern Agricultural College, Wye.	Kent, Surrey, Sussex.

Special Courses in Forestry are provided at the Universities of Oxford and Cambridge and the University of North Wales, Bangor, as well as at Armstrong College, Newcastle-upon-Tyne, and at the Royal Agricultural College, Cirencester.

Special grants to the amount of £1000 per annum are made by the Board in aid of forestry education provided at the four first-named institutions.

A practical School of Forestry, established in 1904, is maintained by H. M. Office of Woods, etc., in the Forest of Dean.

A sum of £1200 per annum for two years has been allocated from the Development Fund in aid of forestry research at Oxford, Cambridge, Bangor, Cirencester and Armstrong College, and a sum of £1000 per annum for minor forestry experiments.

A grant has been made by the Development Commission of £2500 yearly for three years for the purpose of providing technical advice in forestry. With this object, England and Wales have been divided into five districts and an advisory officer has been attached to a teaching institution in each district.

The Districts are as follows: Northern, Welsh, Central and Southern, Eastern, and South-Western.

1019 - **The Agricultural Colonial Institute at Florence.** — *Istituto agricolo coloniale italiano*, 13 pp. Florence, May 1913.

The Agricultural Colonial Institute at Florence was founded in 1911 with the object of offering intending colonists the possibility of preparing themselves thoroughly for farming in the colonies. The course of instruction, which lasts two years, is divided into two parts. The first, of a preparatory character, lasts from November 3 to June 30, and the second, or complementary course, lasts from October 1 to June 30.

The curriculum is the following:

First year: Colonial agriculture, general botany, natural sciences in their relation to agriculture, applied mathematics (exercises in map-drawing, valuation and book-keeping), geography and meteorology, French.

Second year: Colonial agriculture, plant geography, systems and diseases of colonial plants, colonial agricultural and chemical technology, colonial farming, climatology and commercial geography, colonial laws and history, colonial live stock breeding, colonial hygiene, colonial entomology, English, Spanish or Arabic as desired.

The lectures are completed by numerous practical exercises. After successfully passing the examination at the end of the second year, regular students obtain the diploma of colonial agriculture.

In the autumn of 1912, for the first time, a course of tropical veterinary science was held for veterinary surgeons; similar courses will henceforward be held regularly. This year the course will last from September 15 to October 14. The course of lectures embraces the following subjects: geography, live stock breeding, entomology, tropical veterinary sciene, hygiene, accompanied by practical work in bacteriology, and breeding and clinical practice.

In the current year from September 15 to November 8 a higher course of colonial agriculture will be held for men already possessing a diploma in agriculture. The programme embraces colonial geography, plant geography, colonial agricultural, meteorology, colonial farming and its products, colonial live stock breeding, colonial farming, colonial history, economics and law; precautions against diseases of men and animals in the colonies. Lectures on agriculture and economy in the Argentine. Those students who pass the examination at the end of the course get a special diploma.

1020 - **Agricultural Demonstration Work in the Philippine Islands.** — *The Philippine Agricultural Review*, Vol. VI, No. 6 (Demonstration and Extension Number), pp. 265-302. Manila, June 1913.

A law has been passed by the Philippine Legislature " to establish stations for practical instruction in matters concerning agricultural demonstration and development ".

As 90 per cent. of the farms are of less than 5 hectares (12 ½ acres) in area, and the vast majority of the Filippino farmers do not read either English or Spanish, a special method of procedure, known as cooperative agricultural demonstrations, has been adopted.

1. *Cooperative demonstration plots on the farms.* — In each place the farmers wishing to benefit from the system become cooperators. Inspectors of agriculture visit the farms and take charge of a plot, which is cultivated according to the best methods, though only by means available to the small farmer. The cooperator gets the benefit of the example and of the increased crop obtained by the improved methods. This system, already adopted in other countries, has everywhere given excellent results.

2. *Demonstration stations* — There will be one of these stations per province; they are the headquarters at which the inspectors are trained and to which they return from time to time to keep in touch with the work. They also produce the seed for distribution to the farmers, and will be used for trying new crops; they also carry on demonstrations on a large scale.

For some years the Philippine railway companies, following those of the United States, have been distributing selected seed and other aids to agriculture. The financial results of this are most interesting: thus the maize traffic of Iloilo in three months in 1912 was greater than in the three preceding years together.

The Manila Railroad Company is constructing a special car for agricultural demonstrations. This will take members of the staff of the Bureau of Agriculture from place to place with all the modern material for instruction (lantern projections, improved products, drawings, etc.); leaflets and selected seed will be distributed free.

1021 – **Provisions for the Trial Year of Tuition for Women Teachers of Agricultural Housekeeping.** — *Ministerialblatt der Königlich Preussisches Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 6, pp. 157-161. Berlin, June 1913.

The Ministerial Decree of April 26, 1913, contains the provisions concerning the object and the lines of study to be pursued by the women teachers of agricultural housekeeping during the year of probation ordered by the Decree of September 30, 1909, and gives the list of the schools in which the year of probation may be spent.

1022 – **The Work of the Swiss Agricultural Association in the Year 1912.** — *Jahresbericht des Schweizerischen Landwirtschaftlichen Vereins pro* 1912, 70 pp. Brugg, 1913.

AGRICULTURAL INSTITUTIONS

The present annual report of the Swiss Agricultural Association for 1912 gives, after a general review of the economic conditions of the year 1912 and of the work of the Swiss Peasants, Secretariat and of the Peasants' Federation, a table of the branch and trade associations (30 with 60 326 members) and describes the special work of the Association in the meeting of delegates and sittings of the board, by the diffusion of technical publications, and by the giving of lectures by travelling teachers; it further reports upon the work of the several branch associations, of the commission for the promotion of the cultivation of plants and of the commission for promoting the breeding of pigs and goats. It contains also data on the progress of the Swiss agricultural insurance against accidents, and on the intercantonal seed markets.

AGRICULTURAL SHOWS AND CONGRESSES

1023 – Agricultural Shows.

Austria-Hungary.

1913. Sept. 24 - Oct. 5. Graz (Styria). — Agricultural show of the alpine regions.

Autumn. St. Polten (Lower-Austria). — Agricultural and industrial show.

Oct. 11-19 Budapest. — Regional horticultural show.

Belgium.

1913. Dec. 6-8. Jemeppe-sur-Meuse (Liège). — Second International Poultry Show, organized by the "Société Avicole" of Jemeppe. Secretary, M. Jos. Ghysens, rue Hôtel-Communal, Jemeppe-sur-Meuse.

France.

1913. Nov. 8-10. Troyes (Aube). — Show of chrysanthemums, flowers, fruit and vegetables in season, organized by the "Société d'Horticulture, Viticulture et Fruiticulture de l'Aube". Address: M. Lucien Baltet, General Secretary, Troyes.

Nov. 16-20. Paris. — International show of poultry, rabbits, etc., organized by the "Société Nationale d'Aviculture de France". Address to the Office of the Society, 34, rue de Lille, Paris.

Germany.

1913. Oct. 7-12. Berlin. — Twentieth German show of barley and hops.

Italy.

1913. Oct. 9-10. Morbegno (Prov. Sondrio), Warehouse of the "Società caricatori d'alpi". — Cheese show of the Valtellina. An exhibition of cheese-making appliances is annexed. Address to: "Consorzio pro Gelsicultura", Morbegno.

1914. March - November. Genoa. — International maritime exhibition. The 5th section, 2nd group, includes beverages: dessert wines, liqueurs, vermouths, medicinal wines, ciders, musts, non-alcoholic beverages, brandy, vinegars.

April 15-30. Rome. — Special competition of materials for packing citrus fruits, organized by the "Società degli Agricoltori Italiani", by arrangement with the Ministry of Agriculture; annexed to the Second Exhibition of Agricultural Novelties, organized by the same society. Prizes amounting to £ 63, and medals. Address to the offices of the Society, Via XX Settembre 8, Rome.

Spain.

1914. Spring. Barcelona. — Poultry show.

End of 1914 or beginning of 1915. Barcelona. — International Electrotechnical Exhibition, organized by the Catalonian Electrical Engineers' Association.

Switzerland.

1913. Oct. 10-13. Renens. — Poultry show. Address to the general commissioner, M. Paul Mayor, Bussigny, Vaud.

1914. Berne. — National Swiss Exhibition (Industrial and Agricultural).

Tunis.

1914. April 15-22. Tunis. — International Competition of mechanical ploughing apparatus open to machines of all systems. A sum of £ 800 to £ 2000 has been allotted for this competition; after deduction of the costs of organization, cartage and fuel, the remainder will form money prizes for the competitors. Address to: "Direction Générale de l'Agriculture", 78 Boulevard Bab-Benat, Tunis.

Union of South Africa.

1914. Agricultural shows will be held at the following places:

Feb. 10-11. Robertson. — Feb. 10-12. Britstown. — Feb. 12-13. Worcester. — Feb. 17-18. Caledon. — Feb. 18-19. Queen's Town. — Feb. 24-27 Rosebank. — Feb. 25-26. Graaf Reinet. — Feb. 26-28. King William's Town. — March 2-4. Middelburg (Cape). — March 5-6. East London. — March 10-11. Molteno. — March 12-13. Aliwal North.

— March 12-13. Grahamstown. — March 12-13. Humansdorp. — March 17-20. Port Elizabeth. — March 24-27. Kimberley. — March 31-April 3. Bloemfontein. — April 14-17. Johannesburg. — April 15-16. Oudtshoorn.

United Kingdom.

1914. March 24 - April 4. Earl's Court, London. — International exhibition of the petrol industries; a section will be devoted to petrol motors.

June 24 - July 9. London. — International exhibition of rubber, including cotton, fibres and other tropical products.

1024 – **Agricultural Congresses.**

Belgium.

1914. Brussels. — Sixth International Dairy Congress, organized by the International Dairy Federation. Address to: M. L. Gedoelst, general secretary of the Federation, 15 rue Meyerber, Brussels.

France.

1913. Oct. 14-19. Vernon (Eure). — Annual Congress of the "Association française pomologique" specially devoted to fruits used for cider-making.

1914. Reims. — Third National French Cold-storage Congress.

Spain.

1914. Spring. Barcellona. — Poultry Congress.

Switzerland.

1914. June 8-10. Berne. — Sixth International Congress of the Dairy Industry, organized by the Universal Dairy Association. There will be four sections: Hygiene, Chemistry and Bacteriology, Dairy Economics, General Trade. The papers on the subjects of study will be drawn up and printed in German, French, Italian and English. As these papers are to be distributed to members of the Congress before the 1st of May 1914, they should reach the general secretary before the end of 1913.

United Kingdom.

1914. June 24 - July 9. London. — International Congress of Tropical Agriculture. A section will be devoted to palms and their products.

1915. June. London. — Sixth International Congress of Mining and Metallurgy, Applied Mechanics and Practical Geology.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1025 – **Soil Moisture Determinations for Cotton.** – ROBSON, W. (Curator) in *Report on the Botanic Station, Montserrat*, 1911-1912, pp. 5-6. Barbados, 1913.

A plot of "Sakellarides" cotton, a quarter of an acre in extent, was divided into 4 squares and the diagonal sections weeded weekly and fortnightly, respectively. Three series of soil moisture determinations were made at intervals of one month, and three samples were taken from each section. The determinations were made by subjecting the samples to 4 hours' drying at 100° C. After cooling, the samples were weighed, and a check drying of one hour was given. The cotton was planted on August 11, and the following results were obtained.

August	11,	plot	hoed	weekly	9.52	per cent	moisture
»	»	»	»	fortnightly	10.55	»	»
September	19,	»	»	weekly	10.89	»	»
»	»	»	»	fortnightly	10.46	»	»
October	13,	»	»	weekly	9.10	»	»
»	»	»	»	fortnightly	9.40	»	»

These determinations do not show that there was any gain in soil moisture resulting from weekly as against fortnightly weeding. The soil from the differently treated plots was reaped and weighed separately, and here again no advantage is shown on account of weekly weeding. The plot weeded weekly yielded 97 lbs. of seed-cotton, and that done fortnightly 98 lbs.

1026 - **The Effects of Calcium and Magnesium Carbonates on some Biological Transformations of Nitrogen in Soils.** — KELLEY, W. P. in *University of California, Publications in Agricultural Sciences*, Vol. 1, No. 3, pp. 39-49. Berkeley, December 14, 1912.

The writer carried out some experiments on a light sandy soil, which, after being sieved, was mixed with various quantities of calcium and magnesium carbonate and 5 gms. of dried blood per 100 gms. of soil.

The whole was then placed under optimum moisture conditions, and the amount of ammonia formed after 7 days of incubation was determined. A second series of experiments was carried out with a sandy soil containing a vigorous nitrifying flora, which was mixed with 2 per cent. of dried blood and various quantities of calcium and magnesium carbonate, the nitric nitrogen being determined after 21 days.

The results obtained would indicate that calcium carbonate has a limited stimulating action on ammonification, which is intensified in the case of nitrification. On the contrary, with magnesium carbonate a distinct toxic action was recorded, ammonification being one third less than in the controls, and nitrification being completely inhibited. No antagonism was observed between calcium and magnesium carbonates.

Other observations would indicate that, though these results cannot yet be generalized, before a satisfactory understanding of the lime magnesia question in regard to field crops is presented, it is imperative to have more specific knowledge concerning the effects produced on the various soil organisms, especially those connected with nitrogen transformations.

The writer is continuing his research along these lines.

MANURES AND MANURING

1027 - **Mixed Dressings of Calcium Cyanamide and Nitrate of Soda: Results obtained in Sweden.** — BOLIN, P. (Meddelande Nr. 79 från Centralanstalten för försöksväsendet på jordbruksområdet, Jordbruksafdelningen Nr. 21) in *Kungl. Landtbruks Akademiens Handlingar och Tidskrift*, Year 52, No. 4, pp. 276-281. Stockholm, 1913.

The possible advantage of a mixed dressing of calcium cyanamide and calcium nitrate or sodium nitrate and the utility of experiments on the subject has already been discussed (1).

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(1) See No. 491, *B.* March 1912; No. 899, *B.* June 1912. (*Ed.*).

The writer carried out some experiments on oats in various parts of Sweden, comparing dressings of 200 kilog. per hectare (178 lbs. per acre) of sodium nitrate, 220 kilog. (196 lbs. per acre) of calcium cyanamide and a mixture of 110 kilog. of calcium cyanamide and 100 kilog. of sodium nitrate per hectare (98 lbs. + 89 lbs. per acre). All the plots received in addition 200 kg. of 20 per cent. superphosphate and 100 kg. of 37 per cent. potash salts per hectare (178 lbs. + 89 lbs. per acre). The mean results of 12 trials were as follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Control (no nitrogen)	2 327	3 272	—	—	—	—
Sodium nitrate, before seeding	2 572	3 828	244	556	100	100
Sodium nitrate, ½ applied as top dressing	2 616	3 884	289	612		
Cyanamide, before seeding .	2 593	3 780	266	508	109	91
Cyanamide + sodium nitrate before seeding	2 637	3 919	310	647	128	118

Out of the 12 results, 7 were superior to the total mean, and 5 were inferior, the partial means being as follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Mean of 7 experiments.						
Control	2 035	3 077	—	—	—	—
Sodium nitrate	2 230	3 525	195	448	100	100
Cyanamide	2 417	3 674	382	597	196	133
Cyanamide + nitrate	2 399	3 795	365	718	187	160
Mean of 5 experiments.						
Control	2 735	3 543	—	—	—	—
Sodium nitrate	3 049	4 252	313	709	100	100
Cyanamide	2 839	3 929	103	386	33	33
Cyanamide + nitrate	2 969	4 090	234	547	75	77

Basing himself on these figures and the general conditions of the experiments, the writer is of opinion that though cyanamide alone may have some favourable influence on the crop, it is not as effectual as sodium nitrate alone and that the mixed dressing is still more effectual than either substance used alone.

Finally, the question as to whether the mixed dressing be an economical one depends largely on the prices of the two manures. With nitrogen worth 1.20 krona per kilog. (7.5*d* per lb.) in calcium cyanamide and 1.60 krona per kilog. (10.2*d* per lb.) in sodium nitrate, the mixed dressing used in the above experiments would in several cases have effected a saving.

1028 - **The Absorbing Power of some Silicates of Potassium.** (Mitt. aus dem Agrikultur. chem. Laboratorium der Univ. Jena). — BÜSSMANN, E. in *Journal für Landwirtschaft*, Vol. 61, No. II, pp. 97-134 + 6 figs. Berlin, 1913.

A large majority of German investigators (Remy, Hiltner, Popp, Wagner, Tacke, Pfeiffer, Soxhlet, Haselhoff, Neubauer, Mach, Krüger, and others) are agreed that phonolite cannot be considered as an equivalent substitute for the Stassfurt potassic salts. Hiltner alone has drawn attention to the fact that phonolite may exert a favourable action on the absorbing and assimilating power of the soil.

In order to investigate the beneficial influence of the silicates of potassium, the writer carried out some absorption trials with powdered phonolite and with "Kalktrassdünger" (product obtained by treating "trass", alcaline trachitic tufa, with lime under steam pressure) and compared them with those obtained with the three following soils: 1) A loam ("Lehmboden") from Westphalia derived from a sandstone with a clay binding; 2) a clay soil from the district of Jena produced by the disintegration of "Röt" strata (uppermost layer of a mottled Triassic sandstone); 3) a fine alluvium ("Marschboden") containing a high proportion of clay, from the district of Lüneburg. The composition of the five substances employed per 100 parts of perfectly dry substance is given in Table I, and the results of solubility trials in Table II.

The absorption experiments were carried out in 2 series:

a) When the solutions to be absorbed were of a definite concentration (50 gms. of the absorbing material were treated with 200 c. c. of $\frac{N}{10}$ and $\frac{N}{100}$ solutions for varying periods of time).

b) When the concentration of the solutions to be absorbed varied, (50 gms. of the absorbing material were treated with 200 c. c. of $\frac{N}{2}$, $\frac{N}{4}$, $\frac{N}{8}$, $\frac{N}{16}$, $\frac{N}{32}$, $\frac{N}{64}$, $\frac{N}{96}$ solutions for a definite period of time).

The following are the chief conclusions drawn from the results:

I. The absorption of ammonium chloride is considerable in the case of "Kalktrass" and the alluvial clay from Lüneburg, still high in the case of phonolite, poor in the case of the "Röt" clay from Jena, and slight in the case of the Westphalian loam.

II. In weak solutions, potassium is *adsorbed* and in strong solutions it is *absorbed* by all substances, the intensity of absorption being in the

TABLE I.

	Phonolite	« Kalktrass »	Loam from Westphalia	« Röt » clay from Jena	Alluvial clay from Lüneburg
Silica	55.55	56.34	83.79	50.00	76.58
Alumina	19.56	13.61	6.33	16.06	8.37
Ferric oxide	3.13	2.22	5.24	11.23	6.94
Oxide of manganese	trace	trace	trace	0.04	trace
Lime	1.78	14.10	0.86	9.79	2.08
Magnesia	trace	1.03	—	1.04	3.97
Potash	9.41	2.68	1.41	1.16	0.12
Soda	9.23	2.83	1.01	1.12	1.48
Sulphuric acid	0.91	trace	1.25	0.38	0.42
Carbonic acid	trace	7.46	—	9.14	—
Phosphoric acid	0.09	0.08	0.25	—	—
Reaction	weak alkaline	alkaline	neutral	alkaline	alkaline
Water in air-dry substance	3.79	9.86	3.52	13.04	12.74

TABLE II.

Solvent	Per 100 parts of dry substance					
	Substance treated	Insoluble residue	Silica	Ppted by ammonia	Potash	Soda
20 % Hydrochloric acid	Phonolite	16.85	52.36	19.01	3.04	8.75
	« Kalktrass »	20.57	42.67	13.33	2.23	2.62
10 % » »	Phonolite	23.52	47.99	18.63	2.09	7.65
	« Kalktrass »	35.13	30.87	13.07	2.09	2.38
2 % » »	Phonolite	41.86	36.20	17.02	0.71	4.25
	« Kalktrass »	50.12	18.94	11.02	0.86	2.09
2 % Citric acid	Phonolite	52.54	29.55	16.71	0.09	1.15
	« Kalktrass »	64.97	11.27	9.94	0.29	1.15

following order: phonolite, "Kalktrass", "Röt" clay, alluvial clay, loam.

III. Calcium is only absorbed in appreciable quantities by "Kalktrass", probably by superficial concentration; phonolite *absorbs* calcium from weak solutions and *adsorbs* it from strong solutions, while the soils absorb practically none from weak solutions and very little from really strong solutions, the little being in proportion to their clay content.

IV. Nitric nitrogen is never absorbed.

V. The loam soil, phonolite, and the "Röt" clay fix magnesium chemically, at first in large quantities and later in slight quantities. The alluvial clay does not absorb magnesium at first, then absorbs it in considerable amounts and later in smaller amounts. Both the alluvial clay and "Kalktrass" in concentrated solutions yield up again part of their magnesium.

VI. Phosphoric acid is only held chemically; to the greatest extent by "Kalktrass" and to the least extent by the loam. All three soils come below "Kalktrass" and phonolite in order of absorption power.

VII. In the majority of the absorption experiments where strong solutions were employed, the absorbing power remained below the calculated curve of normal superficial concentration.

VIII. In all the absorption experiments, a certain amount of water is removed physically from the saline solutions, so that the absorption figures are slightly too low.

IX. Finally, from a consideration of the relation existing between the soil mass and the quantity of fertilizing substances applied, phonolite and "Kalktrass", cannot be looked upon as a satisfactory means of increasing the absorbing power of the soil.

In connection with these experiments, the writer carried out some other trials on the possible influence of phonolite and "Kalktrass" on the nitrogen-accumulating power of arable soil. The results were positive and showed that an application of phonolite or "Kalktrass" favours in a definite and appreciable manner the conditions of life required by *Azotobacter* in the soil, thus contributing to the enrichment of the soil in nitrogen. But as the total number of factors which contribute to this effect is still unknown, for the present the application of these two materials cannot be recommended in practice. Nevertheless the writer made the following hypothetical calculation: a dressing of 1 000 lbs. of phonolite per acre would in 9 months increase the nitrogen content in a layer of soil 8 in. deep by 14.4 lbs. per acre, which would be equal to 68 lbs. of sulphate of ammonia or 89 lbs. of nitrate of soda.

1029 – **Present Condition of the Mineral Phosphate Industry at Curaçao (Dutch West Indies).** — PENSO, E. (Belgian Consul at Curaçao) in *Recueil Consulaire*, Vol. 162, No. 6, pp. 411-415. Brussels, 1913.

Beds of mineral phosphates abound in the Dutch West Indies (Curaçao, Buen Ayre, and Aruba), the richest being in Curaçao (85 to

87 per cent of tricalcic phosphate) and in Aruba (77 to 80 per cent. of tricalcic phosphate. (1).

At the present time the Aruba beds are being worked, and the produce is exported by the limited liability company "Aruba Phosphaat Maatschappij" to whom the Dutch Government has granted the exclusive right of working the beds and exporting the mineral. Transport is effected by steam and sailing ships; in 1912, 20 057 tons valued at £ 10 000 were exported to England, Belgium, France, Italy, the Netherlands, and Portugal.

The working of the rich beds in Curaçao was suspended a number of years ago on account of a disagreement between the proprietors and the worker of the beds. The latter undertook all extraction expenses and paid a royalty of £ 1 on every ton exported; the exports were not to exceed 2 000 tons per annum unless the balance were re-established the following year. From 1875 to 1885 large quantities were exported in excess and then, prices having fallen, the worker of the beds ceased exporting altogether on the strength of the above clause and the accumulated excess over the annual 2 000 tons. The proprietors protested, and the beds were put up to auction and were bought by Hope and Co., bankers of Amsterdam, who formed a limited liability company with a capital of £ 500 000 and paid the colonial exchequer £ 10 312 for all rights. It is expected that the beds will again be worked in the second quarter of 1913.

The writer draws attention to the fact that the "Aruba Phosphaat Maatschappij" paid dividends of 700 per cent. previous to the discovery of the Florida beds, but that at present the prices are very low.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

1030 - **Distribution of Nicotine in the Leaves of Kentucky Tobacco.** — CICERONE, D. and MAROCCHI, G. in *Bollettino tecnico della Coltivazione dei Tabacchi*, Year XII, No. 3, pp. 119-123. Scafati, May-June, 1913.

The work of d'Errara and of De Toni led to the conclusion that the nicotine in tobacco is located in the epidermal tissue. The writers limited their investigations to the leaves and sought to determine which parts contained the largest quantity of nicotine, using a variety of first class Kentucky tobacco for the purpose. The leaves were dried by direct heating and analysed after having undergone slight fermentation for 4 months in small heaps.

In the long axis of the leaf, the median zone is always richest and the basal zone poorest, the apical zone being almost equal to the median zone. The marginal zone is always richer than the central zone. In the rib the nicotine content decreases regularly from apex to base and the rib as a whole contains about two-thirds less than the leaf blade.

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(1) See: *Production et consommation des engrais chimique dans le monde*, pp. 8-13: Rome, 1913. — O. STUTZER. *Die wichtigsten Lagerstätten der "Nicht-Erze"*, Erster Teil, pp. 389-393, 1911. — K. MARTIN. *Geologische Studien über Niederländisch-Westindien*, 1888.

Nicotine per 100 *dry matter in various parts of the blade and of the midrib.*

Samples from	Avellino	Monticchio	Caserta	Scafati	Cava Tirreni
Blade:					
Apical zone.	7.45	5.07	7.46	7.67	7.00
Median »	7.71	5.31	7.70	7.94	7.81
Basal »	7.00	3.97	5.72	7.34	5.80
Marginal »	7.49	5.62	7.75	8.30	7.64
Central »	6.52	4.24	6.44	7.00	7.67
Rib:					
Apical zone	2.85	2.16	2.70	3.16	3.22
Median »	2.17	1.17	1.52	2.47	2.65
Basal »	1.74	0.66	1.37	1.47	1.52

1031 - **Some Results obtained in Studying Ripening Bananas with the Respiration Calorimeter.** — LANGWORTHY, C. F. and MILNER, R. D. Nutrition Investigations, Office of Experiment Stations: in *Yearbook of the United States Department of Agriculture*, 1912, pp. 293-308. Washington, 1913.

In order to keep fruits in season for any length of time, it is necessary to be able to retard or accelerate their maturation as the case may be, and to prevent subsequent deterioration phenomena. Successful handling of fruit therefore will largely depend on an exact knowledge of the changes involved in the ripening, after-ripening, and decay of fruit, their causes and the means of controlling them.

The respiration calorimeter (1) offers a new means of studying maturation phenomena in fruit, and the writers record the first results obtained with bananas during the active ripening period. These results show that the ripening changes progress regularly to a maximum, and then decline; that at its greatest intensity the heat produced is equivalent approximately to 1 calorie per hour per kilog. of bananas. The heat liberated is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into cane sugar, and the cane sugar into invert sugar, and that there are important changes in the character of the tannin compounds, and that other changes occur brought about by the production of aroma and flavour bodies, and perhaps in other ways. It has also been found that in addition to the transformation of carbohydrates there is an actual loss of this food constituent during ripening. From the data for oxygen consumption, carbon dioxide production and heat output, it appears that the heat liberated by the ripening bananas is largely due to the destruction of carbohydrate.

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(1) *U. S. Dep. of Agriculture. Yearbook*, 1911, p. 491. (*Ed.*)

Certain experiments now under way will, when completed, permit of conclusions of practical importance being drawn.

1032 – **On the Presence of Connecting Threads in Graft Hybrids.** — HUME, M. in *The New Phytologist*, Vol. XII, No. 6, pp. 216-220. London, June 1913.

The writer examined the graft hybrids *Cytisus Adami*, *Solanum tubingense*, and *Solanum kœlreuterianum* in order to determine whether the presence of connecting threads between the tissues of the two component plants could be observed. In the case of *Cytisus Adami* their presence had already been demonstrated by Buder (1), and the writer merely confirmed his observation. In the case of *Solanum tubingense*, connecting threads were observed in the stem between the epidermal cells (derived from *S. lycopersicum*) and the underlying layer of cells (derived from *S. nigrum*). The threads were not situated in pits, though the cell wall was usually thinner in those regions perforated by the threads, and the median node of each thread was very marked and liable to split. No threads were observed in *Solanum kœlreuterianum*, and the writer attributes the failure to faulty material or methods of preparation.

The presence of threads connecting genetically unrelated tissues throws some light on the origin of the threads; they must "arise secondarily, since it is to be supposed that the naked cytoplasm of the two components does not come into contact. At any rate it is clear that the threads cannot have arisen from spindle-fibres, since no nuclei of the two components have ever been sisters."

PLANT BREEDING

1033 – **The Inheritance of certain Quantitative Characters in Tobacco.** — HAYES, H. K. in *Zeitschrift für Induktive Abstammungs -und Vererbungslehre*, Vol. 10, No. 1-2, pp. 115-129. Berlin, June 1913.

The Mendelian interpretation of the inheritance of quantitative characters is considerably complicated by fluctuating variability which is due to external conditions and non-inherited. In order to eliminate this factor as far as possible, the writer grew parents at the same time as the F_1, the F_2, and the F_3 generation and under similar environmental conditions. If the quantitative character under investigation were inherited in the Mendelian manner, the variability of the F_1 generation should not be greater than that of the parents, while in the F_2 generation it should be greatly increased. Certain F_2 forms should breed true in F_3, giving no greater variability than the parent types; other F_2 forms should give decreased va-

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(1) BUDER, J. Studien an *Laburnum Adami*: II. — *Zeitschrift für indukt. Abstammungs- und Vererbungslehre*, V, 1911, p. 209.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
403 (Sumatra).	1910	—	24–31	150	28.2±0.08	5.27±0.21
403 — 1.	1911	29	23–31	125	26.5±0.11	6.64±0.28
403 — 1 — 1	1912	29	21–32	151	26.2±0.12	(2)8.28±0.32
401 (Broadleaf)	1910	—	17–22	150	19.2±0.12	5.00±0.19
401 — 1.	1911	20	16–22	108	19.1±0.05	6.54±0.30
401 — 1 — 1	1912	22	17–23	145	19.9±0.07	6.08±0.24
(403×401) (1) F_1	1910	—	19–26	150	23.6±0.07	5.51±0.21
(403×401) — 1 F_2 . .	1911	25	17–32	2 402	22.8±0.03	9.52±0.11
(403×401) — 3 F_2 . .	»	24	17–35	1 632	22.7±0.03	8.99±0.11
(403×401) — 4 F_2 . .	»	21	17–33	1 958	22.5±0.03	9.51±0.10
(403×401) — 1 — 2 F_3.	1912	25	19–29	131	22.5±0.09	6.44±0.27
(403×401) — 1 — 3 F_3.	»	26	17–29	186	24.1±0.10	8.51±0.30
(403×401) — 1 — 4 F_3.	»	24	18–26	182	22.0±0.08	7.54±0.27
(403×401) — 1 — 6 F_3.	»	23	20–28	194	23.9±0.08	6.61±0.23
(403×401) — 2 — 1 F_3.	»	21	15–25	188	20.4±0.08	8.04±0.24
(403×401) — 1 — 7 F_3.	«	22	17–28	207	21.5±0.10	10.14±0.34
(403×401) — 1 — 10 F_3	»	26	19–27	151	23.5±0.10	7.83±0.30
(403×401) — 1 — 12 F_3	»	25	18–30	209	23.7±0.14	10.51±0.41
(403×401) — 1 — 8 F_3.	»	28	19–33	82	26.3±0.20	10.38±0.55
(403×401) — 3 — 5 F_3.	»	27	17–28	159	21.7±0.11	9.45±0.36
(403×401) — 3 — 6 F_3.	»	28	16–27	229	22.5±0.09	8.71±0.26
(403×401) — 3 — 8 F_3.	»	25	17–23	85	20.6±0.12	8.25±0.43
(403×401) — 1 — 13 F_3	»	25	16–29	179	22.5±0.09	10.84±0.39

(1) Cross made in 1909. — (2) Rather a high figure for an inbred line and probably due to high manuring and rank growth.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
405 (Cuban)	1910	—	16–25	150	19.9±0.08	7.53±0.28
405 — 1	1911	21	18–23	124	20.6±0.07	5.29±0.23
405 — 1 — 1	1912	23	17–25	150	20.9±0.07	6.17±0.24
402 (Havana)	1910	—	17–24	150	19.8±0.07	6.98±0.27
402 — 1	1911	20	16–25	143	20.3±0.10	8.87±0.35
402 — 1 — 1	1912	20	17–22	150	19.4±0.05	4.59±0.18
(402×405) (1) F_1	1910	—	15–25	150	19.8±0.07	6.10±0.24
(402×405) — 1 F_2	1911	—	14–33	192	20.9±0.16	15.84±0.54
(402×405) — 1 — 2 F_3 . .	1912	20	13–29	112	19.7±0.18	14.67±0.67
(402×405) — 1 — 3 F_3 . .	»	20	15–22	142	18.4±0.09	8.56±0.34
(402×405) — 1 — 4 F_3 . .	»	28	20–35	148	26.6±0,16	11.20±0.44
(402×405) — 1 — 5 F_3 . .	»	30	22–34	45	28.8±0.28	10.00±0.20
(402×405) — 1 — 6 F_3 . .	»	22	13–29	201	20.1±0.15	16.17±0.56

(1) Cross made in 1909.

riability in F_3 when compared with F_2 generations; and others should show as great variability as the F_2 generation itself.

The subjects of the experiments were two tobacco crosses: Sumatra × Broadleaf and Cuban × Havana: all these varieties were known to be of fixed and uniform type, and the character investigated was the number of leaves per plant from the fourth leaf from the bottom to the leaf below the bald sucker at the top, that is to say the number of leaves usually harvested.

The results from the Sumatra-Broadleaf family are shown on p. 1364. In 1910 the F_1 generation was intermediate between the two parents for leaf numbers, and its variability was about the same. In 1911 the F_2 generation gave a greatly increased variability, and though the three F_1 individuals selected as parents differed in the number of their leaves, all gave similar results, showing the variation of the F_1 generation to be non-inherited. Of the 13 selections sown in the F_3 generation in 1912, two show about the same variability as the parents, four are intermediate in variability between the parents and F_2, three show about the same variation as the F_2 generation, and four show a slightly larger variability than the F_2 generation. The two types which were as uniform as the parents were both of intermediate value as compared with the parents for leaf number.

With the Cuban × Havana family the same sort of results were obtained (see table, p. 1365).

In the F_3 generation one selection gave a variability only a little higher than the parents, two gave variabilities as great as F_2, and two were intermediate. It should be noted further that the two selections grown from 28 and 30 leaved parents gave mean leaf values of 26.6 and 28.8 respectively. Thus, by crossing two strains having mean values of about 20 leaves per plant, a new type has been produced with a larger number of leaves.

The writer interprets these results by assuming that in the Sumatra × Broadleaf cross each parent is pure for the same basal condition of 20 leaves, and that in addition the Sumatra parent has some inherited properties which result in the production of 26 leaves and which are due to three interchangeable allelomorphic pairs each inherited separately, the heterozygous condition being half the homozygous condition. In the Cuban × Havana cross he supposes the parent forms to be represented by gametic values for each leaf number of 16 *AA BB* and 16 *CC DD*, whence F_1 gives 16 *Aa Bb Cc Dd*, or 20 leaves, and F_2 a greatly increased variability. The writer points out that these assumptions illustrate the idea, though in the actual cross the conditions are more complex, owing to the interaction of a greater number of factors.

CEREAL AND PULSE CROPS

1034 – **Cereal Experiments in the Texas Panhandle.** – Ross, J. F. and Leidigh, A. H. – *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 283, pp. 79. Washington, June 1913.

The so-called Texas "Panhandle" is that part of the State which projects northward between New Mexico and Oklahoma. Formerly the land was occupied by large cattle ranges, but these have been gradually replaced by farmers and agriculturists, and for the guidance of these later settlers, local experimental stations became a necessity. The first was established at Channing in 1903, and later was moved to Amarillo, while minor experiments have been carried out at two sub-stations.

The district is a high, dry, windy plain from 2000 to 4000 feet above sea-level. The annual rainfall varies from 18 to 23 inches and is irregularly distributed, a large proportion falling in torrential showers so that much of the water runs off and is lost to the land.

The atmospheric humidity is low, the evaporation is high, and violent fluctuations of temperature occur; sunshine is abundant and the nights are comparatively cool.

A large number of cereal crops have been tried and numerous varieties tested: of the small grain crops, winter wheat has proved on the whole the most profitable, but even in this case the yields are low and do not average 15 bushels per acre. Spring grain gave unsatisfactory results, and maize was quite a failure. But the grain sorghums proved the most dependable crop of all. During the 5 years 1907-11 the average yield of all varieties of milo at Amarillo was 23.5 bushels per acre, while some of the varieties averaged nearly 28 bushels per acre.

The trials have included variations in the time of seeding and in the amount of seed sown per acre, as well as a few tillage experiments, so that definite information on the best methods of cultivating the crops is now available for those farmers who require it.

FIBRE CROPS

1035 – **Manuring Experiments on Cotton in Italy.** — VARVARO, U. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Nos. 4 and 6, pp. 275-282 and 385-392. Modena, 1913.

During the past few years there has become manifest a distinct movement in favour of the cultivation of cotton in Southern Italy, with the object of reawakening the interest of farmers in the crop and allowing it to assume once more the place it once occupied in Sicilian agriculture. In 1864 there were 83 650 acres under cotton in Sicily, producing 23 632 tons of lint, while at present the annual production has dropped to about 3 000 tons.

Manuring is usually neglected, though cotton requires a soil which has been will prepared and well manured, and the success of the whole rotation will be largely dependent on the manner in which these two processes have been carried out. In fact the cotton plant is a voracious feeder: a good crop of 1340 lbs. per acre removes from the soil:

Nitrogen	63 lbs.
Phosphoric acid	28 »
Potash	59 »

Counting the wheat which follows in the rotation at a proportional yield of 45 bushels per acre, the elements to be returned to the soil per acre would be as follows:

Nitrogen	146 lbs.
Phosphoric acid	72 »
Potash	115 »

The writer carried out some manuring experiments during the period 1911-1912, at Menfi (province of Girgenti) with the variety "Biancavilla" on a uniform calcareous loam of medium fertility and situated almost on level ground. The plots measured 100 sq. metres ($^1/_{40}$ acre approx.) each, and received the following treatment:

Plots	1,	7,	13	no manure
»	2,	8,	14	660 lbs. farmyard manure
»	3,	9,	15	green manuring with beans
»	4,	10,	16	*id* + 13 lbs. of mineral superphosphate
»	5,	11,	17	*id.* + *id.* + 4 ½ lbs. sulphate of potash
»	6,	12,	18	*id.* + *id.* + *id.* + 6 ½ lbs. gypsum.

The fertilizers were applied in November when also the beans were sown; the farmyard manure was spread previously.

The green crop was turned in on February 12th and the cotton seed was sown on March 17th.

The returns were as follows :

	No manure	Farmyard manure	Green manuring.	Green manuring. Superphosphate	Green manuring. Superphosphate. Sulphate of potash	Green manuring. Superphosphate. Sulphate of potash. Gypsum
Mean production per acre:						
Total . . . . lbs.	648	784	735	865	999	1003
Seed . . . . . »	183	240	219	251	330	329
Lint . . . . . »	465	544	516	614	669	674
» . . . . . %	28.2	30.6	29.8	28.9	33.0	32.8
Time of harvest .	Aug. 26 to Oct. 9	Aug. 17 to Oct. 9	Aug. 10 to Oct. 9	Aug. 10 to Oct. 9	Aug. 4 to Oct. 9	Aug. 4 to Oct. 9
Receipts and expenses per acre:						
Total value of production (1) . .	£5 7s.	£6 19s.	£6 8s.	£7 6s.	£9 10s.	£9 10s.
Total cost of manure	—	£3 15s.	£1 1s.	£2 0s.	£3 0s.	£3 5s.
Value of unexhausted residue left in soil	—	£2 7s.	5s.	18s.	£1 7s.	£1 9s.
Value of manure removed by cotton crop . . .	—	£1 7s.	18s.	£1 2s.	£1 13s.	£1 16s.
Profit due to manuring	—	5s.	5s.	17s.	£2 10s.	£2 6s.

(1) The prices obtained were: 150 lire per quintal (2.2d. per lb.) for the lint, and 5 lire per quintal (£2.10s. per ton) for the seed.

The figures and general conditions of the experiments lead to the following conclusions.

I. The application of $12^{1}/_{2}$ tons per acre of farmyard manure raised the yield appreciably and favoured the early ripening of the bolls.

II. The green manuring with beans gave similar, though less marked, results ; the early ripening however was still more marked.

III. The addition of 5 cwt. per acre of superphosphate to the green manuring increased the yield, showing that the soil requires phosphoric acid.

IV. The further addition of 1 ½ cwt. per acre of sulphate of potash to the dressing again raised the yield and the power of early maturity of the plant, showing that the soil required a supply of readily assimilable potash.

V. The application of gypsum gave no useful results.

VI. The application of all the manures proved remunerative, green manuring together with superphosphate and sulphate of potash heading the list.

Finally, green manuring with beans takes the place of farmyard manure, which is wanting in Sicily, and supplies the soils with the organic matter they lack.

1036 – **The Renovation of the Abaca (Manila Hemp) Industry.** — SALEEBY, M. M. in *The Philippine Agricultural Review*, Vol. VI, No. 4, pp. 167-182. Manila, April 1913.

In value and importance the abaca crop of the Philippine Islands is second only to rice, and the necessity of reorganising the former industry on a sounder basis has recently been emphasized by a series of calamities, in the shape of typhoons and drought, which have struck the islands.

The writer points out some of the contributing causes for the present condition and suggests some practical remedies:

1. *Selection of suitable sites.* Plantations should be established on rich soils where they will receive an abundant rainfall uniformly distributed.

2. *Cultural methods.* Plants should not be set less than 13 feet apart; deep cultivation, which proved most valuable during recent droughts, should be practised, and the land irrigated wherever possible. The renewal of old plantations should not be carried out by setting new shoots between the old ones, but by establishing an entirely new plantation.

3. *Improvement of the quality of the fibre.* The following table will show that careful extraction yields a higher percentage of the good quality fibre, whereas a higher percentage of the poor grades is actually exported:

	Yield with careful extraction	Exported in 1912 —
Low grades	5	32
Current grades	10	40
Good current grades	25	18
Good grades	35	10
Best »	25	

The better qualities down to "good current" are put to special exclusive uses; the demand for them is considerably above the supply, and prices are not only very high but very stable, whilst the poorer qualities have to compete with other products, showing conclusively the immense advantage of increasing the output of the higher grades. To attain this end so long as a good defibrator is not available it will be necessary to concentrate efforts towards improvement on:

4. *The adjustment of relations between buyers and producers.* Producers frequently know of means which would enable them to obtain high quality fibre, but as the local buyers will not pay a sufficiently high price, the planter finds it more profitable to turn out lower grade produce. The buyers or middlemen on the other hand refuse the higher prices partly because, being at the same time merchants, they prefer to keep the poorer class of producers dependent on them and partly because they cannot themselves distinguish between the various grades of fibre and feel safer in buying the lower grades where the differences are more apparent. The writer suggests the following reforms in this connection: 1) the enlightenment of the uneducated class of producers by means of experimental fields, etc.; 2) the formation of planters' cooperative associations; 3) the creation of uniform standards for each quality.

1037 – **A Textile Plant from the Sudan.** — HOUARD, A. in *L'Agriculture Pratique des pays chauds*, Year 13, No. 121, pp. 277-291. Paris, April 1913.

The flower stalk of *Vigna catjang* var. *textilis* ("Kien") yields a fibre which the natives use for making string, but, for the present, it is of no economic importance. The writer gives an account of its botanical, agricultural, and commercial character.

OIL CROPS

1038 – **Cohune Nuts from British Honduras.** – *Bulletin of the Imperial Institute*, Vol. XI, No. 2, pp. 226-230. London, April-June 1913.

These nuts are the produce of the cohune palm (*Attalea Cohune*), native of British Honduras, where it occurs over two-fifths of the area. The yield per tree is about 2 cwt., corresponding to some 2000 nuts.

The kernels, which are rich in oil, are not used on a large scale because of their very hard shells. But as machines for breaking them are now being tried, it seems advisable to determine the characters of the product.

The fibrous covering of the fruit contains an oily substance which may be of value when the kernels are worked.

The following figures show the characters of the oil from samples of these nuts received by the Imperial Institute:

	1	2	3	4
Specific gravity at 15°C	0.870	0.871	0.871	0.868
Acidity	3.5	13.1	1.2	20.4
Saponification value	255	256.5	256.5	252.4
Iodine value	13.6	13.7	11,4	13.7
Melting point of the fatty acids	19.8°	21.0°	20.2°	19.7°

From these figures it is seen that the oil is a good deal like coconut oil. The yield of the kernels in fat is about the same as that of copra. Kernels sent to Europe carefully packed and on a commercial scale should fetch about the same price as copra.

RUBBER, GUM AND RESIN PLANTS

1039 – **Tapping Experiments with *Hevea brasiliensis*.** — De Jong, A. W. K. in *Mededeelingen van het Agricultuur Chemisch Laboratorium*, No. IV, pp. 1-34. Buitenzorg (Java), 1913.

The writer gives the results of some Hevea experiments he carried out at Buitenzorg (Java) to determine the influence of the position and slope of the incision on the yield of latex:

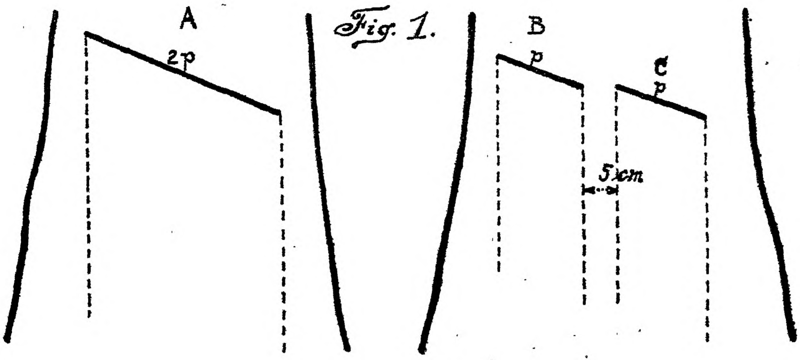


Fig. 1.

1) Incisions of equal length, made at equal height and in the same direction 2 inches apart give practically the same results.

2) Such incisions any given number (n) inches apart, and distributed all round the trunk also give the same results.

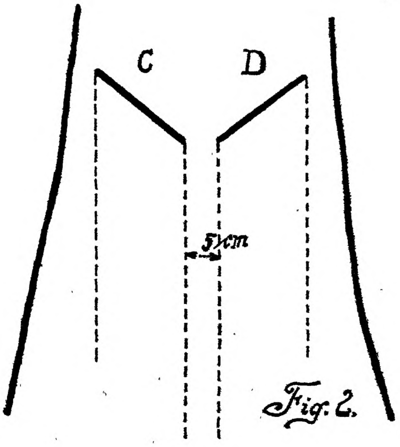


Fig. 2.

3) Considering on the one hand the incision A equal in length to $2p$, and on the other hand the two incisions B and C, in the same direction and at the same height as A, each being equal in length to p (therefore $B + C = 2p = A$), if the yield for A is taken as 100, two

series of experiments gave 119.7 and 123.9 for B + C, or in other words the double incision gave about 20 per cent. more latex than the single incision.

4) Keeping the other factors constant the writer tapped trees both to the left and to the right, the incisions being 2 in. apart. Taking the left-hand tapping, or C, as equal to 100, the right hand tapping, or D, gave 85.7, or approximately 14 per cent. less.

5) The writer also varied the distance between the incisions, which had been constant in the previous experiment, and still the yield of the left-hand tapping was to that of the right-hand tapping as 100 to 88.8, or an appreciable difference in favour of the former.

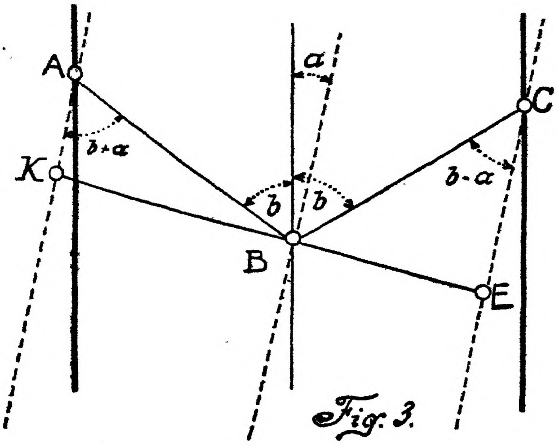


Fig. 3.

Interpretation of results. Petch, working in Ceylon, found that left hand tapping (C, fig. 2) usually yielded more latex than right-hand tapping and suggested the following explanation: the fibres of Hevea are not absolutely vertical, their general direction being that of a helix rising towards the right hand; the medullary rays and latex tubes will be inclined in the same direction, whence in the left-hand tapping more latex tubes are severed and consequently more latex is obtained.

Petch worked with a small number of individuals and the writer repeated the experiments to confirm the results.

Fig. 3 represents a longitudinal cut of a Hevea, the dotted lines representing the direction of the latex tubes. A B and BC are two opposite incisions both forming the same angle *b* with the direction of the tree trunk and being of unit length; *d* is the angle formed by the latex tubes with the direction of the tree trunk.

If Petch's hypothesis be correct, the quantity of latex yielded by A B and B C will be proportional to the lengths K B and B E (K E being perpendicular to the latex tubes); then

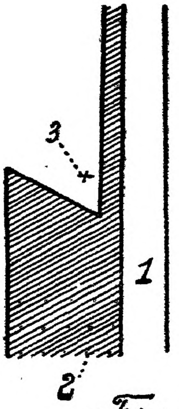
$$\begin{aligned} KB \text{ being } &= \sin(a+b) \text{ and} \\ BE \quad \text{»} \quad &= \sin(b-a) \end{aligned}$$
$$(\text{since } AB = BC = 1) \text{ therefore}$$
$$\frac{\text{Yield of } AB}{\sin(a+b)} = \frac{\text{Yield of } BC}{\sin(b-a)};$$

b is known or easily measured; to obtain a value for *a*, the writer adopted several methods :

1) He removed a vertical strip of cortex and cambium, and moistened the wound with a potash solution, when the fibres appeared as white lines whose slope could be measured.

2) He first removed a vertical strip of cortex, and then removed the fibres from the tree, but the latter was a difficult process.

No constant value was obtained for *a*, and it even varied perceptibly between two points on the same tree, so that the writer was obliged to carry out a large number of measurements *on both sides of the tapping* in his experiments. When values were assigned to *b* and *a* in the equation I, it worked out approximately true, thus confirming Petch's hypothesis.



1 = cambium.
2 = bark.
3 = gutter.

Fig. 4.

As to values for the angle *a*, the writer gives the following figures : Out of 316 direction experiments, in 7 cases the fibres had an upward inclination towards the left, in 9 cases they were vertical, and in 300 cases they had an upward inclination towards the right; the mean for *a* was 3.7° to the right, and extremes varied between 5° to the left and 9.5° to the right.

During the 9 months' experiments the excess yield of the left-hand tapping over the right-hand tapping, which was 26 per cent. during the first three months, gradually fell to 16 per cent. during the next three months and to 12 per cent. in the last three. These differences should be attributed to the inexperience of the coolies who at the start, not being accustomed to left-hand tapping, removed too much cortex, and it is probable that 12 per cent. most closely appromixates the truth.

Conclusions.

1. Petch's hypothesis is a rational one.
2. As a method of tapping, the half herring-bone to the left is to be prefered to the herring-bone or half herring-bone to the right.
3. The ideal angle (*i. e.* the one yielding a maximum amount of latex for a minimum of cortex removed) would be at right angles to the latex tubes, but as the incision would then be almost horizontal, the latex would tend to run over the side instead of down the cut; to avoid this defect, the writer proposes that a little gutter should be formed (fig. 4) which would enable the slope of the cut to approximate more nearly the ideal angle without quite attaining it.

1040 – **Enquiry on *Manihot piauhyensis*** (1). – GIRARD, E. and CAYLA, V. in *Journal d'Agriculture tropicale*. Year 13, No. 144, pp. 161-165. Paris, June 30, 1913.

The writers give the results obtained with *Manihot piauhyensis* at An-Loc in Cochinchina.

The trees in question were planted between heveas standing at 16 by 33 ft., and were tapped over one-tenth of their circumference by means of five or six herring-bone cuts sloping at 45° and 4 inches apart.

These trees began to be tapped regularly in December 1912, at two and a half years old; their circumference at 3 ft. was then 12 to 16 inches. The experiments deal with the period December to March, which is the driest part of the year and corresponds to the slowest vegetative growth.

The mean daily yields were:

Dec. 1912	5.07	grams
Jan. 1913	5.30	»
Feb. 1913	6.75	»
March 1913	7.30	»

The general average is 6.13 gms. of fresh rubber, that is about 4 gms. of dry rubber per day. Reckoning 200 tapping days a year, the yield at two to three years of age would be 800 gms. (nearly 2 lbs.), a really remarkable quantity.

A striking feature is the "formidable" development of the *M. piauhyensis* trees at An-Loc: some of those three years old cover more than 30 sq. yds. of ground, while in the Serras of Piauhy they are quite little trees.

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(1) See No. 367, *B.* April 1913. (*Ed.*)

As the climate of Cochinchina, with its dry season, is similar to that of the country of origin of the manihots, the Asiatic results must be due rather to the richness and depth of the plateau soils, and especially to their water-content; indeed the manihot regions of Brazil are almost water-less.

The writers consider *M. piauhyensis* the most likely species of *Manihot* owing to its precocity, its yield, and its resistance to drought.

1041 - **Tea: its Cultivation, Manufacture and Commerce.** - CHANDLER, S. E. and Mc EWAN, JOHN in *Bulletin of the Imperial Institute*, Vol. XI, No. 2. pp. 252-319. London, April-June 1913.

VARIOUS CROPS

The writers give a summary of the cultivation and preparation of tea and then go on to the chief countries producing it.

The world's production in 1912 was about 731 million lbs., distributed as follows (in millions of lbs.):

India	295	Java	63
Ceylon	193	Japan	42
China	112	Formosa	25

A calculation of the consumption per head of population gives 6.2 lbs. for the British Empire and 0.63 lb. for the rest of the world, showing what heavy tea-drinkers the British people are.

British India. — Assam and Bengal make up nine-tenths of the area under tea in India. The progress made since the beginning of tea-growing is shown by the following figures:

Year	Area under tea acres	Esportation of tea lbs.
1838	—	488
1877–78	188 000	36 000 000
1911–12	575 000	264 000 000

The progress is due to two causes:

1) Increase in yield per acre. This varies greatly according to the district (23 lbs. per acre in Western Bengal and 585 lbs. in Eastern Bengal), but in general it has increased 100 per cent. since 1875.

2) The "tea cess". This contribution, which was volontary in 1893 and obligatory in 1903, has just been renewed (1913); it has allowed the opening up of important markets for Indian tea in Russia and America.

Green tea has assumed considerable importance in the last few years:

1909	2 678 000 lbs.
1911	5 210 000 »

Ceylon. — This is the most important rival of India in the tea trade. The progress made has been remarkably rapid:

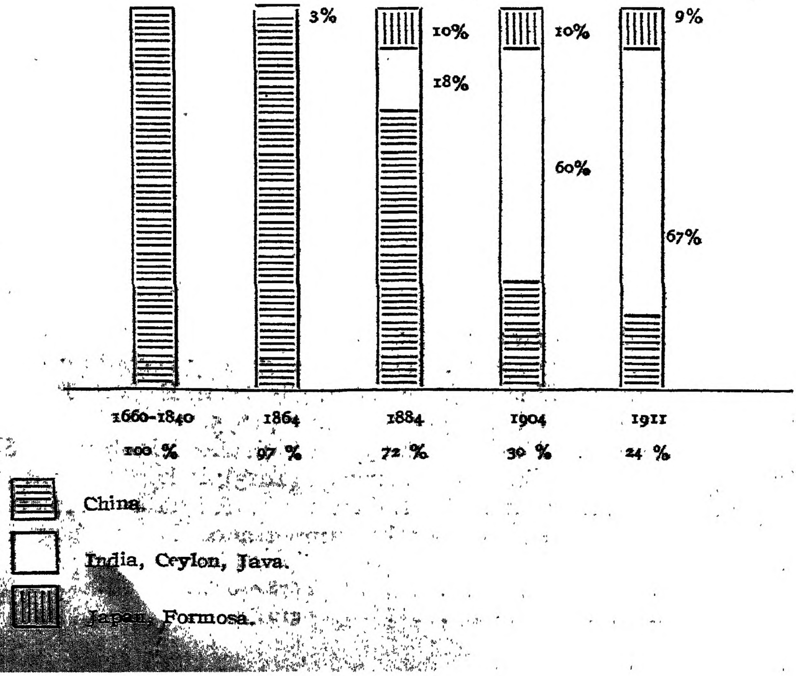
Year	Exportation lbs.
1873	23
1883	1 666 000
1909	192 886 000

For some time the movement has been slowing down, especially owing to the popularity of hevea; it is still, however, the chief crop of the island.

Java. — The yields obtained here are very good, but the better qualities are rare: this is probably due to the nature of the soil.

Early on the exportation remained stationary, being 7 029 000 lbs. in 1884, and 7 062 000 lbs. in 1890; then it rose rapidly to 15 405 000 lbs. in 1900, and actually tripled in the next ten years, reaching 50 518 000 lbs. in 1911; there was a still further increase of 20 per cent. in 1912, to 61 438 000 lbs.

China. — Considering her local consumption, China is probably still the largest tea-producer; but on the world's market, formerly entirely supplied by her, China tea only amounts to 24 per cent. at present. The adjoining diagram shows this decrease.



Japan. — In Japan, tea is often grown as continuous hedges, instead of separate bushes; systematic pruning is only carried out every ten years. In the Uji district, tea is grown under shelters; the product is much appreciated, but is all consumed locally.

For some years the area under tea has been diminishing, but the production has kept on rising:

1902	56 000 000 lbs.
1911	70 000 000 »

The United States take half this amount.

Formosa. — The famous Oulong teas are chiefly exported to the United States. Their special qualities seem to be due to: 1) special varieties, which are at present being studied; 2) propagation by layers (the only example in the world): the best bushes give very little seed, and layers seem to be the only means of keeping all the qualities intact; 3) particular method of preparation, having points in common with those of both black and green teas.

Africa. — Natal is the only tea-producer of any importance outside the East, and its exportation is so far only 2 140 000 lbs. (1911). Lack of labour prevents the extension of this crop.

1042 - **The Production of Coffee in the French Colonies: its Importance in the Consumption of the Mother-Country.** - BERTEAU, A. in *Bulletin de l'Office colonial*, Year 6, Nos. 64-67, pp. 97-112, 146-157, 186-202 and 209-230. Paris, April-July, 1913.

The writer gives the history of coffee-growing in the various French colonies, with many statistics to illustrate it.

Martinique. — After showing the fluctuations since 1835, the writer notes the slight importance of real Martinique coffee on the European markets at present.

Guadeloupe. — From 1790 on, this colony was damaged successively by wars, diseases and the abolition of the slave trade; in the last few years it alone has furnished half of the total exports from the French colonies (1 715 000 lbs. in 1910). While in Martinique and the neighbouring British Antilles coffee has dwindled almost to the point of disappearing, in Guadeloupe it has shown a slight tendency to rise.

Ivory Coast. — The exports of 1910 (76 450 lbs.) show an increase over those of the previous year (64 150 lbs.).

French Congo. — In 1896, of the 9850 lbs. exported, only 295 lbs. were destined for France. But since 1900 almost all the Congo coffee has gone to the home-country; in 1910 this amount was 106 870 lbs. out of a total exportation of 106 980 lbs.

Madagascar. — The following figures show the progress made: in 1901 the exports were 258 lbs.; in 1903, 3 100 lbs.; and in 1910, 243 980 lbs. The production of this colony is coming to be of importance.

Réunion. — Between 1830 and 1840, the island exported over *two million pounds* of coffee a year; various calamities fell upon the island, and the exportation in 1910 was only 258 250 lbs.

New Caledonia. — The introduction of small colonisation (with small holdings) brought the exportation up to 1 380 750 lbs. in 1903, but the ignorance of the planters as regards tropical agriculture reduced it to 651 090 lbs. in 1905; since then, better organization of the coffee plantations has helped matters, and the figure for exports from the colony in 1910 stood at 1 143 700 lbs.

Indo-China. — Coffee seems to do well in this colony, witness the following figures:

1899	770 lbs.
1901	5 117 »
1910	508 835 »

Consumption. — Almost the whole of the coffee from the French colonies is imported by the mother-country, but this amount represents only the *sixty-fifth part* of the total French consumption.

1043 - **Contribution to the Study of Vanilla.** — ADVISE-DESRUISSEAUX, P in *L'Agriculture pratique des pays chauds*, Year 13, No. 121, pp. 265-276. Paris, April 1913.

In growing vanilla, it is important to gather the fruits in their optimum state of ripeness, as otherwise the prepared product has a lower market value.

The writer sums up the characters of vanilla ready for preparing:

1) whole surface dull;
2) both lateral lines yellow;
3) the lines below the epidermis yellow or yellowish green, giving the whole fruit a slightly yellow tinge of green.

In these conditions: 1) the vanilla is sufficiently ripe; 2) it can hang some time, which allows the pickings to be spaced out, so economizing labour; the "yellow tip" criterium is not a guarantee of ripeness, and entails more frequent pickings.

The planter should attempt to obtain a product as heavy as is compatible with quality; the writer has therefore investigated the influence of cultural methods on the density of the pods. He finds that fruits ripened in the shade are denser than those ripened in the sun; the loss of sun-ripened pods is 4 per cent.

To obtain heavy pods, if the supporting trees will not keep their leaves till after the fruit is picked they should be headed back two or three months after they come into leaf; the physic-nut (*Jatropha Curcas*) is useful as a support.

In very moist countries, vanilla ripened in the sun is found to be richer in perfume than that ripened in the shade. In this case the planter must decide what pays him best.

1044 - ***Sophora glauca.*** — *The Planter's Chronicle*, Vol. VIII, No. 21, p. 302. Bangalore, June 28, 1913.

Sophora glauca is very abundant in the Nilgiris, Shevaroys, Coory and Mysore. The following analysis was made by the Government chemist at Coimbatore:

	Per cent. of dry matter	Per cent. of ash
Nitrogen	2.57	—
Phosphoric acid	0.54	9.73
Potash	1.35	24.14

This plant is therefore rich in nitrogen and potash. Mr. Harrisson recommends it as a green manure for tea and coffee; it is particularly useful when it can be cut in the jungle and brought to the plantation.

FRUIT-GROWING

1045 – **On a Graft-Hybrid between Peach and Almond.** — DANIEL, L. and DELPON, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2000-2002. Paris, June 30, 1913.

In 1905 a vigorous almond tree at Mas-Grenier (Tarn-et-Garonne) was cut back to a short distance above the butt. It threw up a certain number of shoots which were budded in August, when growth had ceased, with buds from a yellow-fruited peach commonly grown in the neighbourhood, which had never shown any variation. The following spring, all the buds grew well, and that autumn there were already some fruit-buds. The following year these flowered at the usual time and gave yellow-fleshed peaches exactly like those of the variety from which the grafts were taken.

In the third year, all the shoots began to change in a curious way. The flowers, though like peach flowers, gave fruits more or less intermediate between peaches and almonds. The flesh was rather thin, soft, tender and coloured like that of the peach, but of distinctly poor quality. The stones were intermediate in varying degree, as regards size, shape and furrowing, between normal peach and almond ones.

A point of interest was that the hybrid shoots did not arise from the graft callus, as usually happens with such occurrences (*Cytisus Adami*, *Crataegomespilus Dardari*, *Pyrocydonia Danieli*). The grafts bore none of them within a foot of the point of union. Towards the centre of the tree pure peach and almond shoots occurred isolated. There were also here and there fruiting branches of three sorts: pure almond, pure peach, and intermediates. Sometimes a single branch bore both peach and almond leaves. The habit of the graft differed from that of both species; the shoots were more upright and regular and formed an almost hemispherical crown. These phenomena were repeated in the following year, so that the variation was fixed. But as the owner found this curious tree of no use in practice, he destroyed it.

Two stones from the grafted tree have germinated; one of the young trees is vigorous, the other weakly; neither has yet flowered. The leaves show that they have some points of resemblance with both peach and almond. The stipules of the first are large and drop late, as with peach, but the teeth of the leaves are large and regular as in almond; numerous leaf-nectaries are arranged as in peach, and the veins are also like those of peach leaves. The anatomical structure of the petiole and blade recalls that of the almond. The stipules of the second tree are deciduous and small, as in almond, but the arrangement of the nectaries and teeth is like that of peach leaves ; the veining is closer, as in almond. The structure of the petiole and blade is about as in the peach.

The chracters of the graft-hybrid here described, with leaves, fruits and stones intermediate between those of the stock and the graft, show considerable resemblance to those of *Amygdalus communis persicoides* Ser. of horticultuists ; this is considered as a sexual hybrid, but its origin is not really known. It seems more reasonable to suppose that it is really a graft hybrid which has been multiplied without its being known what it was.

Its occurrence at a good distance from the graft-callus shows that graft-hybridization may take place at a varying distance from the union of the tissues, and this agrees with the phenomena recorded by one of the writers in the case of egg-plants and capsicums grafted on tomatoes, as well as with grafted vines. It also recalls the cases recorded by horticulturists a few years ago of pure almond shoots appearing on peaches on almond stock; but in this hybrid the reaction was much more complete, as, besides the pure shoots of stock and graft occurring side by side, there were organs in varying degrees intermediate between the two species (leaves, fruits and stones) ; in fact it presents a mosaic of poecilodynamic characters, while those previously recorded for peach were mosaics of dichodynamic characters.

1046 – **Olive Growing in Tunis.** – CAMPBELL, C. in *L'Agricoltura Coloniale*, Year VII, No. 6, pp. 201-215. Florence, June 1913.

After some information on the conditions of soil and climate under which olive growing is carried on in Tunis, the writer remarks that the botanical and biological sides of the question have not been equally well studied. He gives a summary of his previous publications on this subject. A description is given of the M'gharsa contract, according to which the Arab cultivator takes all the produce of the olive grove for ten years so as to pay the expenses of cultivation ; after this the proprietor takes half the produce of the grove, now in full bearing.

The article concludes with the following remarks: 1) the problem of olive growing in North Africa may be summed up in the botanical and biological study of the cultivated and wild olive; 2) large nurseries should be established in various places so as to undertake the selection of trees which will bear without grafting; 3) new varieties should be created for special biological conditions; 4) species of *Olea* that might be useful as stocks should be grown.

1047 – **Manuring of the Carob.** — DI MATTEI, V. *Le piante arboree in provincia di Siracusa*, Part IV (La coltivazione del carrubo); pp. 81-86. Syracuse, 1913.

The cultivation of the carob in Italy is almost confined to the province of Syracuse (Sicily). In the five years 1890-94, out of a total production of 82 500 tons, 45 000 were produced in the province of Syracuse, and 30 000 in that of Cagliari (Sardinia), the rest in other parts of Sicily and in Apulia. The varieties of *Ceratonia Siliqua* L. grown in the province of Syracuse are: *saccharata*, *latissima*, *racemosa* and *falciata*.

This Leguminous tree is generally grown in dry and stony ground, associated with cereals alternating with pasture and fallow; but this treatment docs not allow it to reach its full yield. Manuring is little practised; to determine its influence the writer started an experiment in the territory of Syracuse, on a plantation 20 years old with marly soil.

Six groups of five equally grown trees were selected; the first dressing was applied on the 21st of October 1908, the manure being spread in basins about 8 inches deep over the area shaded by each tree; the second application was made on the 9th of December 1910, and the third on the 2nd of February 1913. The amounts applied per group were as follows:

Group	Mineral superphosphate — lbs.	Sulphate of potash — lbs.	Sulphate of ammonia — lbs.	Nitrate of soda — lbs.
I	—	—	—	—
II	$8\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	—
III	$8\frac{3}{4}$	$3\frac{1}{4}$	$2\frac{1}{4}$	—
IV	$8\frac{3}{4}$	$4\frac{1}{2}$	$2\frac{1}{4}$	—
V	$8\frac{3}{4}$	—	$2\frac{1}{4}$	—
VI	$8\frac{3}{4}$	$2\frac{1}{4}$	—	$2\frac{3}{4}$

The yields were as follows:

Group	1910 — lbs.	1911 — lbs.	1912 — lbs.	Total — lbs.
I	463	399	817	1 679
II	758	99	1 214	2 071
III	780	97	1 124	2 001
IV	771	346	1 388	2 505
V	551	70	1 159	1 780
VI	577	320	1 102	1 999

In 1909 and 1913 there was no crop, and in 1913 the trees were also severely attacked by mildew (*Oidium Ceratoniae* Comes).

The main conclusion is that the increased yield docs not pay for the expense of digging the basins and the cost of the manure; for this reason the writer recommends indirect manuring through the leguminous forage or seed crop grown between the trees. He recommends the following dressing per acre: mineral superphosphate 630 lbs., sulphate of potash 90 lbs., sulphate of ammonia 45 lbs. Manure should also be given if the trees are headed back, as is commonly done.

LIVE STOCK AND BREEDING.

HYGIENE

1048 - ***Schistosomum turkestanicum*** **Skrjabin, new Parasite of Cattle in Turkestan.** - SKRJABIN, F. K. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 7, pp. 457-468. Berlin, July 5, 1913.

The parasite found by the writer in the *vena porta* of numerous head of cattle in the Syr-Daria region has a great resemblance to *S. bomfordi* Montgom., but differs sharply from it in the shape of its eggs. These are oval, pointed at their extremities and all of them differing from each other. Their length varies between 0.0725 and 0.0740 mm., and their breadth between 0.0222 and 0.026 mm. By the number of vescicules of the testicles, this species approaches the schistosomes of birds.

Besides being distinguished from other species by the shape of its eggs it differs also in its outer structure (*S. turkestanica* Skj. being sickle-shaped), in the conformation of its male sexual glands and of other interior organs.

The writer describes the species very minutely.

1049 - **On the Presence of Tubercle Bacilli in the apparently Healthy Udder Tissue of Tuberculous Cows.** - ISHIWARA, T. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 1-2, pp. 1-9. Jena, July 29, 1913.

The writer examined for tubercle bacilli the apparently healthy udders of 26 very tuberculous cows at the slaughter yard of Munich, and in 19.3 per cent. of the cases found macroscopic latent tuberculosis of the udder. Considering the small number of bacilli found in the five udders the writer as well as Ostertag come to the conclusion that clinically healthy animals, even when they give reaction with tuberculin do not pass bacilli into the milk. On the other hand the milk of clinically tuberculous cows, even when the udders appear to be healthy, should not be used unless previously boiled.

ANATOMY AND PHYSIOLOGY

1050 - **Left-Sided Bearing in Cows.** — GIOVANOLI, G. in *Schweizer Archiv für Tierheilkunde*, Vol. 55, Part 7, pp. 376-380. Zürich, July 1913.

A description of many cases of left-sided bearing. The writer considers such cases to be of much more frequent occurrence than is generally supposed. According to him, as a rule, cows can bear on the left and the right sides alternately without thereby producing mal-formed calves. If calves borne on the left side are mis-shapen, which need not always be the case, the cause is the confined position in the uterus. The observations of the writer have not confirmed Wundt's opinion that left-sided bearing produces digestive disturbances in cows.

1051 – **The Correlation between Genital Glands and Dentition.** — ROBINSON, R. in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2016-2018. Paris, June 30, 1913.

According to the observations made by the writer in the cases of the ass, dog and man (which are described in this work) there is an intimate correlation between the male genital glands and the dental system. If the genital glands are removed early, or their secretion is strictly limited throughout life, the nutrition of the teeth and their consequent development and powers of resistance are superior to when sexual activity commences soon and is continually much exerted.

The writer considers the nutrition disturbances which often occur in the case of syphilitic and tuberculous persons to be partly due to injuries to the reproductive organs. Conversely the entire removal of the teeth in the case of man may cause atrophy of the genital glands, and even occasionally sterility.

1052 – **Researches Respecting the Boron Content of Milk and Eggs.** — BERTRAND, G. and AGULHON, H. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2027-2029. Paris, June 30, 1913.

According to the analyses of the writers, one litre of human milk contains 0.08 mgm. of boron, while the same quantity of ass' and of cow's milk contains 0.1 mgm. and 0.2 mgm. of this element respectively. In birds' eggs, contrary to what occurs in the case of iron and manganese, boron is localised, not in the yolk, but in the white. The boron content of 1 kg. of the white of hen's, turkey's and goose's eggs is 1 mgm.

The writers conclude that boron, which was found in every analysis, is a catalytic constituent of the animal cell.

1053 – **The Presence of the Barred Plumage Pattern in the White Leghorn Breed of Fowls.** — HADLEY, P. B. in *The American Naturalist*, Vol. XLVII, No. 559, pp. 418-428. New York, July 1913.

BREEDING

When White Leghorn cocks were crossed with Black Hamburg hens, the resulting F_1 generation were all white, but not pure white however, for every individual had some fleckings, though in some cases the latter were extremely inconspicuous. In a small proportion of birds, both males and females, there were present from one to three wholly barred or more often partly barred feathers. The F_2 generation yielded blacks, greys, whites, splashed whites, and barred birds, the barring in the latter covering the whole body and resembling the marking in the old unimproved Plymouth Rock breed. The proportions in which the different types appeared were as shown in the table on p. 1384.

The Black Hamburg parent could not carry the barring factor unless it also carried an inhibitory factor for barring; therefore the writer assumed that the barring factor (*B*) was carried by the White Leghorn parent, for which factor it was homozygous as well as for the factor (*I*) which inhibited the manifestation of black in the plumage. He assumed further that the male was homozygous for the absence of the female sex factor (*F*) for which the females were heterozygous, and that both parents carred a factor

	Total No.	White	Black			Barred			Grey
			♂	♀	?	♂	♀	?	
1911	117	90	0	9	3	4	2	5	4
Expected .	**117**	**$87\,^{3}/_{4}$**	**0**	**$7\,^{5}/_{16}$**		**$14\,^{10}/_{16}$**	**$7\,^{5}/_{16}$**		
	117	90	16 (1)			11			
Expected. .	**117**	**$87\,^{3}/_{4}$**	**$7\,^{5}/_{6}$**			**$21\,^{15}/_{16}$**			
			♂	♀	?	♂	♀	?	
1912	137	106	0	6	1	14	6	4	
Expected. .	**137**	**$102\,^{3}/_{4}$**	**0**	**$8\,^{9}/_{16}$**		**$17\,^{2}/_{16}$**	**$8\,^{9}/_{16}$**		
	137	106	7			24			
Expected. .	**137**	**$102\,^{3}/_{4}$**	**$8\,^{9}/_{16}$**			**$25\,^{11}/_{16}$**			

(1) Includes the 4 grey fowls.

for black pigmentation and a colour factor; but since it seemed probable that none of the birds in the experiment lacked these factors, they could be omitted from the formulae, which thus became *BB ff II* and *bb Ff ii* respectively.

Lastly, he supposed that in gametogenesis the factor *B* was repelled by *F*. Under these conditions the results of mating should be as follows: for every 16 birds in F_2, 12 should be white, 3 barred and 1 black. The whites should be equally divided between the sexes; of the 3 barred birds, 2 should be male and 1 female; the one black should be a female. Moreover one of the barred males should be homozygous for this factor, while the other male and the female should be heterozygous. Other birds, including both males and females, should carry the barring factor but not manifest the pattern, since they would also be either homozygons or heterozygous for the inhibiting factor *I*.

The figures given in the above table correspond fairly well with the expected so far as the ratio white to dark of 3 : 1 is concerned; and with regard to the discrepancy of the barred to black ratio in 1911, the low number for barred birds may be partly explained by the fact that it is impossible to distinguish blacks from barred in very young chicks. In the 1912 results all chicks which died under 3 weeks old were excluded, and the figures conform closely with the expected. In both years the ratio of barred males to females agrees well with the expected 2 : 1.

Similar evidence with regard to the possession of a homozygous barred character by white Leghorn males was obtained when cocks of that breed were crossed with Black Minorca, Black Java, and Black Spanish hens, but no cross involving the White Leghorn hens has yet been made.

1054 – On Sex-Limited Inheritance in Cats, and its Bearing on the Sex-Limited Transmission of Certain Human Abnormalities. — DONCASTER, L. in *Journal of Genetics*, Vol. 3, No. 1, pp. 11-23. Cambridge, June 1913.

The question as to whether sex-determination is dependent on the male or the female gamete is still unresolved, as is also the nearly related question of how far sex-limitation is absolute when it occurs, and this in spite of the fact that the hypothesis most widely adopted for the explanation of sex-limited trasmission assumes that the sex factor and the factor for the sex-limited character are borne by the same chromosome.

With a view to obtaining fresh evidence on these two points, the writer collected and analysed the data dealing with certain sex-limited affections in man: colour-blindness, night-blindness, nystagmus, and haemophilia. In all four cases, there was an apparent disturbance of the sex-ratio among the offspring of trasmitting females, an excess of affected over unaffected males in affected fraternities, and occasional exceptions to the ordinary rule of sex-limited transmission among the children of affected males. However, on further examination it became evident that there were several possible sources of error in the results, due chiefly to the impossibility of distinguishing a transmitting female unless she has at least one affected son. When certain corrections were applied, the excess of affected over unaffected males in affected fraternities was greatly reduced and the existence of this excess was of importance for the purpose for which the enquiry was undertaken, for in some cases at least sex-limitation was not absolute, but was partial like gametic coupling of other characters, and it seemed possible that the excess of affected over normal males among the sons of transmitting females might be due to the partial coupling of the factor for disease with a sex factor among the gametes of the female parent. The factor for the affection was absolutely or almost absolutely coupled with a sex factor in the gametes of the affected male, for he transmited the factor only, or almost entirely, to his daughters, his sons being very rarely, if ever, affected. If then it were also found that a woman bearing this factor transmitted it chiefly to her sons, there would be absolute sex-limited transmission by one sex, and partial sex-limited transmission by the other sex in the same species.

A basis would thus be provided for a reconciliation of the two types of sex-limited inheritance, exemplified respectively by *Abraxas* and birds on the one hand, and by *Drosophila* and mammals on the other. If this were the case, the high ratio of affected sons of a transmitting woman should be associated with a low ratio of transmitting to non-transmitting daughters; the material examined gave no evidence that this was the case, but as mentioned before the available data were too incomplete to lead to any definite conclusions about the nature of the transmission of these human abnormalities.

On comparing the summary of the human pedigrees with data collected on colour inheritance in cats, it appeared probable that the latter might be able to throw some light on the question, as the transmitting female in this case is visibly different from the non-transmitting.

Orange colour in the cat was taken as analogous to abnormality or to the sex-limited affection, while black corresponded to normality. The orange colour is dominant over black in the male but only partially dominant in the female, so that the female heterozygote is tortoiseshell. In general, an orange male mated to a black female gives black male and tortoiseshell female kittens; in the converse cross, orange female by black male, the male kittens are orange, the females tortoiseshell. The orange male thus usually transmits orange to his daughters only, the orange female transmits it to all her offspring of both sexes. A tortoiseshell female by black male gives orange and black males, tortoiseshell and black females; showing that a female heterozygous for orange transmits the orange factor to some kittens of both sexes.

A summary of the results of over 100 matings showed their similarity to those obtained in the case of the human diseases. In the offspring of the orange male mated to black female there was some excess of females (61 ♀ : 50 ♂), as is also the case among the offspring of men affected with disease, while in the offspring of tortoishell females by black males there was a considerable excess of males (67 ♂ : 35 ♀). Further there was evidence that the sex-limitation of the orange character by the male was not absolute, and that there was an excess of transmitting over non-transmitting daughters (21 : 12). The numbers are small, and further data are required before they can be regarded as significant, but they give no support to the suggestion that the excess of affected males was due to partial coupling of the factor for the affection with a sex-factor in the gametes of the transmitting female.

Until more data are collected, it seems of little value to attempt to express the facts in a factorial scheme, but certain suggestions are made towards such a scheme, and an indication is made of the experiments which would be necessary to verify the hypothesis in so far as coat colour in cats is concerned.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1055 - **Three Years' Work of the Ferndale Cow Testing Association (California).** — ANDERSON, L. in *Agricultural Experiment Station, Bulletin* No. 233, pp. 459-482. Berkeley, California, September 1912.

The first Cow Testing Association in the United States originated in Michigan in 1905, and four years later the above Society was organised at Ferndale in Humboldt County, California. The latter's results for the past three seasons are now available and present some interesting figures: Approximately 600 cows have been under control and the average yield of milk rose from 5 900 lbs. per head per annum in 1909 to 6 890 lbs. in 1911, while the butter fat yield increased from 251 lbs. per head per annum to 291.5 lbs. in the same time. Each member pays from 80 cents (3s. 4d.) to 1 dollar (4s. 2d.) per cow per annum and the tester receives 60 dollars (£12 10s.) a month besides board and lodging and travelling expenses. The cows are tested once a month, but so far no attempt has been made to control the food consumed, as the animals are pastured during three quarters of the year.

1056 - **The General Show of Breeding Stock, Paris, 1913.** — VACHER, MARCEL in *La Vie à la Campagne*, Vol. 14, No. 165, p. 63. Paris, August 1, 1913.

The writer gives a short review of the successes attained by different breeds of cows, sheep and pigs in this year's show and compares the results with those obtained in previous years. He bases on the latter his suggestions of the improvements which should be aimed at in breeding.

HORSES, ASSES AND MULES

1057 - **Inheritance Studies at the Royal Stud of Trakehnen (East Prussia).** — SCHMIDT, BRUNO in *Arbeiten der Deutschen Gesellschaft für Züchtungskunde*, Part 15, pp. 1-359. Hanover, 1913.

The royal stud of Trakehnen, which was established in 1732 by the amalgamation of scattered studs, was at first Crown property, and as such was entrusted with the duty of breeding the saddle and carriage horses required by the court of the king. The stud became State property after the death of Frederick the Great, and only attained importance in horse breeding when its stallions were employed for promoting the breeding of native horses, and then the Littau breeding depôt was established for this purpose in 1787. Since then the Trakehnen stud has been the centre for producing East Prussian pedigree half-breds. According to the writer, the different breeding stations form a large homogeneous stud founded by the chief stud of Trakehnen. If we examine the pedigrees of the stallions which were used for service shortly after its establishment, we find the most different blood represented; it is threfore to be concluded that systematic breeding was not practised at first. Of the stallions imported up to 1749,19 were of unknown origin, 5 were English, 5 Rosenburger, 1 Berber, 1 Neapolitan. Nevertheless, it appears that already at this time the Trakehnen products were good carriage horses. Especially suitable for this purpose were the descendants of the white Persian stallion, *Persianer*, used for breeding from 1739 to 1747, those of his son *Spinola*, and the offspring of the bay stallion, *Pitt*, the Champion trotter. The writer considers that these three stallions, which he has found in the pedigrees of a large number of first-class breeding animals, were the founders of the old Trakehnen breed. Systematic breeding was introduced for the first time by Count Lindenau. The general inspector of horse-breeding appointed in 1886, devoted special attention to increasing the number of brood mares and eliminating hereditary faults.

He had scarcely acquired the necessary stud of brood mares, when war broke out in Prussia, causing a period of inaction and retrogression in breeding operations at Trakehnen. While towards the close of the eighteenth century there was a growing tendency to cross pure bred Arab horses with continental breeds, at the commencement of the nineteenth century, the Arab horses were increasingly replaced by English Thoroughbreds. Later, English half-breds also began to be imported.

Nevertheless, von Burgsdorf, who was Inspector General from 1814 to 1843, was not decided as to the best method to be adopted, for he gave the preference first to pure-bred Arabs, then to English Thoroughbreds, afterwards using Arab stallions again and finally deciding in favour of English Thoroughbreds. More noticeable progress in breeding was made under Schwichow, who was Inspector General from 1847 to 1864 and aimed at crossing for increased vigour. When he had attained his object, he tried to improve the breed by the introduction of pure blood ("Veredelung"). From 1860 almost all the imported stallions were noted English Thoroughbreds. At the present day, there is once more a tendency to limit the use of Thoroughbreds.

While giving a rapid review of the development of the stud, the writer also mentions the results of investigations made respecting the composition of the blood ("Blutaufbau") in the families of the best stallions. By means of pedigrees, which are in part reproduced in the text, he shows which stallions have founded families, how long and for what reasons the descendants of the said stallions have been used for breeding and the influence which they have exerted. The writer has studied 23 lines of stallions in this way.

The analysis and the comparative study of the pedigrees show that the best breeding results were obtained by in-breeding, and that at Trakehnen an effort was made as far as possible to unite the best lines of the same blood, *i. e.* to improve the blood. Those families which were no longer inbred maintained their position on the stud books for a relatively very short period compared with the others.

Valuable families were also rejected owing to fashion in coat colour and other reasons. Many stallions did well and founded families only because they were mated with suitable mares, while others with faultless pedigrees and upon which great hopes were built, retired from the breeding ranks without leaving any traces of their blood because they had not been provided with fitting mates.

At the end of this chapter, the writer deals briefly with the changes which have taken place on the breeding stock at Trakehnen in the course of time. Though the latter was heterogeneous at the commencement, and consisted of Slav, Danish Mecklenburg and Oriental blood, the breeding gradually developed, thanks to the introduction of English half-breds and Thoroughbreds, and has produced a type characterised by constancy, homogeneity and race purity. This has, however, been accomplished only by always using first-class stallions, endeavouring to eliminate original differences without introducing others, and by practising improvement of the blood ("Blutveredlung"). If the large amount of good blood in the Trakehnen horse is not visible at first sight, this is due to the fact that, at present, the principal object in breeding is to obtain a stronger frame.

The following chapter treats of the formation of blood in the mares' families. The writer deals with 20 out of 400 families, basing his observations on their pedigrees. In the case of mares, as in that of stallions, it is stated that the best blood is obtained by inbreeding. Good results are also often produced by crossing and subsequent systematic selection of those individuals which, by a happy combination of circumstances, prove to be of value.

The next chapter treats of the inheritance of coat colour. The writer first gives a summary of the work of Dr. Crampe on this subject, and then attempts by means of examples to explain on Mendelian lines the inheritance of coat colour.

White is dominant over all other colours in horses; a white horse can only be obtained if one of its parents is white, but white horses when mated do not always produce white offspring. Chestnut is always a recessive colour. Bay is recessive as regards white and dominant as regards chestnut.

It is however not possible by means of Mendel's theory to foretell which colour will prove dominant. According to the writer, more light is thrown upon this question by an examination of the animals' pedigrees; thus he cites instances of great power of coat colour transmission taken from the breeding records of Trakehnen and based on colour pedigrees. Contrary to the opinion of Von Öttingen, the writer considers that a black coat can be transmitted with a fair amount of constancy. The writer attributes the presence of white hairs to the use in in-breeding of white horses.

In conclusion, the writer has examined all the Trakehnen breeding material from the point of view of the transmission of hereditary defects. His observations have led to the conclusion that a pathologic fold of the eyelids is hereditary. The transmission of this defect seems to be more marked in the maternal line. At Trakehnen, periodic opthalmia was found to be hereditary in some cases, and not in others. The writer considers that tick is hereditary and can be transmitted by animals which have not got the disease.

Roaring was also proved to be hereditary. Spavin, navicular disease (Schale) and broken windedness were not transmitted. The writer, however, believes that the two first diseases can be transmitted by animals which are much affected by them. It seems that there may be a predisposition in foals to paralysis. The text is accompanied by many portraits of stallions of the best lines.

1058 - **Crisis in Saddle-Horse Breeding in the South and South-West of France.** - 1. RAYNAUD, M. La Crise du Cheval de selle dans les Charentes. — *La Vie Agricole et Rurale*, Year 2, No. 31, pp. 128-129. Paris, July 5, 1913. — 2. COURRÉGELONGUE, M. La Crise du Cheval de selle du Midi. — *Ibid.*, pp. 130-131.

There has been, for some years past, a considerable decrease in the number of saddle horses bred in the South and South-West of France.

Between 1904 and 1909, the number of saddle horses bred decreased by 32 per cent. (mares 40 per cent.) in South-West France, 26 per cent. in Central France and 35 per cent. in the Vendée and the Charentes. On the other hand, there was an increase of 4 per cent. in Morbihan, of 20 per cent. in Côtes-du-Nord and of 53 per cent. in Finisterre.

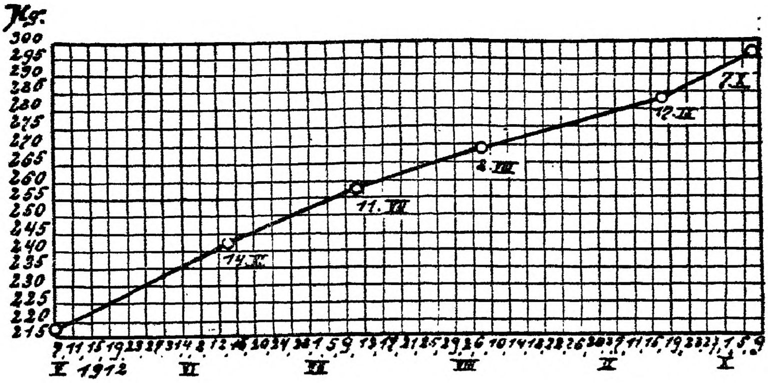
The chief reasons for the decline of the industry are, according to the writers, the increase in cattle, sheep and mule breeding, and especially the unremunerative nature of breeding remounts. In the South of France, a three and a half year old saddle horse costs the breeder on an average £ 53 10s, while the Remount Department has hitherto seldom paid more than £38 for such an animal. Thus the breeder loses £ 15 on the transaction. Should the horse not be purchased by the Remount Department, the loss is still heavier, since the State is the best customer. Seeing the great importance of saddle-horses in the South and South-West of France, both for the army and for agricultural purposes, the writers recommend the adoption of the following measures for encouraging horse breeding.

1. The distribution of the State premiums in proportion to the number of horses bred for the army by each region.
2. The increased purchase of three-year-old remounts and the raising of the price of remounts.
3. The granting of premiums to breeders who retain the best brood-mares for their own use. There should be three classes of prizes (£ 16, £ 12, £ 8) according to the value of the mares.
4. The giving of an annual prize to the breeder each time a mare in his possession is in foal which has been served by an approved or State stallion.
5. The organisation of saddle-horse shows after the pattern of the general cattle show held annually in Paris.

CATTLE

1059 - **The Results yielded in 1912 by the Pasture for Young Cattle at Laineck, near Bayreuth, Bavaria.** — LEX in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 27, pp. 327-328. Hanover, July 4, 1913.

The Laineck pasture belonging to the Herdbook Society of the Bayreuth red and white breed (Simmenthal type), has an area of 117 3/4 acres; it is divided into eight enclosures, and in 1912 it supported 126 head of cattle varying in age from 7 ½ months to 2 years and 7 months. The grazing season began on May 7 and ended on October 9. The grazing dues amounted to 36*s* 3*d* for cattle under 20 months of age, and 41s for those above this age. In addition to the cattle, the pasture supported about 20 foals, and also yielded a little hay and aftermath. The cattle and foals remained day and night in the open, and were only housed in the sheds during the cold September nights. No extra food was given. The health of the animals was good. The cattle were weighed before being driven up, as well as every four weeks during their stay, and two days before leaving the pasture. They were also measured at the beginning and end of the grazing season. The results obtained were as



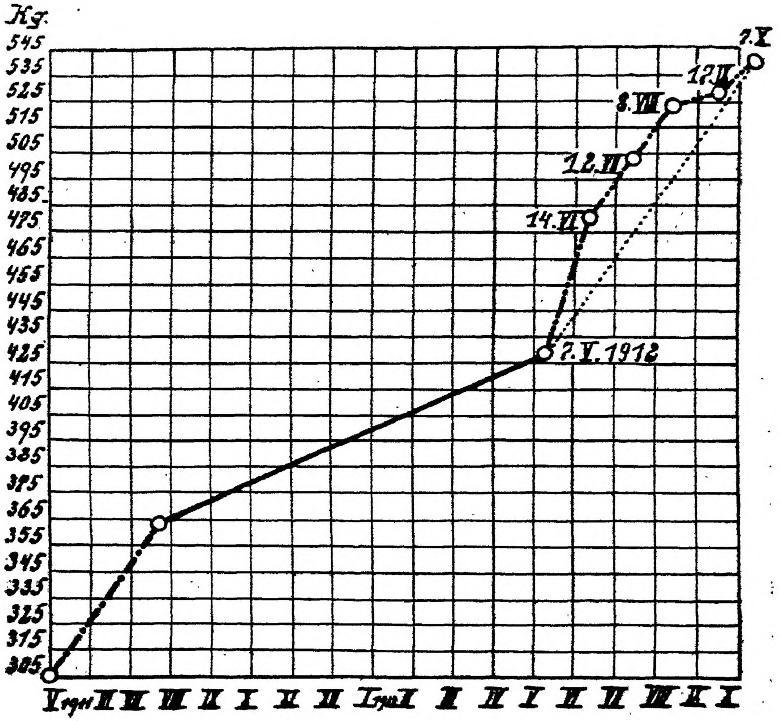


FIG. 1. — Increase in weight of cattle grazed for one season.

FIG. 2. — Increase in weight o cattle grazed for two seasons.

Explanation of fig. 2.

—·—·—·— Increase in weight during the 1911 grazing season.

——————— Increase in weight during stall-feeding in winter 1911-12.

—··—··— Increase in weight during the 1912 grazing season.

follows: 19 per cent. of the cattle attained an increase in weight of over 220 lbs. (maximum 295 lbs.). A young animal, 15 months old and weighing 273 lbs., increased 56 per cent. in weight. The average increase was 24.5 per cent. The average daily increase in weight was 1.18 lb. The total increase in weight was 23 000 lbs., giving 182.5 lbs. per head.

Only in the case of 15 animals was the increase below 110 lbs. The acccmpanying diagrams show the increase in weight of the animals.

The increase in the withers height was:

cm.	1	2	3	4	5	6	7	8	9	10	11
number	2	15	7	19	25	16	14	16	4	2	1

The chest depth increased:

cm.	1	2	3	4	5	6	7	8	9	10
number	2	4	5	10	26	27	20	9	16	5

Increase in girth (chest):

cm.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
number	1	3	1	3	1	4	4	6	5	7	5	9	6	7	9	5	11	5	1	9	7	3	3	0	1	2	3

SHEEP

1060 – **An Illinois Sheep-Feeding Test.** – COFFEY, W. C. in *The Breeder's Gazette*, Vol. LXIII, No. 17, pp. 1004-1005, Chicago, April 1913.

The Illinois Experiment Station has recently closed an 84-day feeding test with Western yearling wethers. The object was to determine the value of different roughages for fattening sheep. Eight lots of fifteen sheep each received rations as follows: Lot 1. Shelled corn (maize) and alfalfa. Lot 2. Shelled corn and alfalfa, corn silage. Lot 3. Shelled corn, corn stover and corn silage. Lot 4. Shelled corn, corn stover and linseed oilmeal. Lot 5. Shelled corn and corn stover. Lot 6. Shelled corn, oat straw and corn silage. Lot 7. Shelled corn, oat straw and linseed oilmeal. Lot 8. Shelled corn and oat straw.

For making gains, the lot receiving shelled corn and alfalfa and the one receiving shelled corn, alfalfa and silage were superior to any others, but these gains were made at a cost per pound exceeding that of any other lots, except those receiving corn, oilmeal and oat straw, and corn and oat straw. Corn and oat straw made a very poor ration; at the end of the feeding period, the animals receiving this ration were for the most part inferior in market condition.

The adding of linseed oilmeal did not pay.

Silage added to the shelled corn and oat straw ration gave a market finish practically equal to that where alfalfa was used.

Oat straw supplemented with silage made a slightly better combination than corn stover and silage both in extent and cost of gains. To the feeder with a silo this has a practical significance, as oat straw is more convenient to handle, and corn stover requires a large amount of labour in cutting up.

However, when silage is not available, corn stover is a better roughage to use with shelled corn than oat straw. Corn stover and silage were far superior to corn stover alone.

The results show that silage is a valuable ration in fattening sheep and lambs when judiciously fed. In no case was it fed in large quantities, or the reason that it was not possible to get the sheep to consume a flarge amount of it.

1061 - **Irish Pig-Feeding Experiments.** - SPENCER, SANDERS in *The Farmer and Stock-Breeder*, Vol. XXVI, No. 1234, p. 1012. London, May 19, 1913.

PIGS

The first reported experiment was said to be entered upon to ascertain whether pigs could be profitably fattened wirthout potatoes. The six pigs used for the experiments were divided into two lots of three each. The first lot were fed on equal parts of Indian meal and pollard for 122 days; the second lot were fed on potatoes and on equal portions of Indian meal and pollard. The increase in weight of the two groups was nearly the same, but was a little superior in the case of the first. Calculating the price fetched by the animals and the cost of their food, it appears that, as the average price of marketable potatoes in Ireland is more than £2 per ton, a mixture of Indian meal and pollard costing 8*s.* per cwt. would generally be a more profitable pig-fattening food than a mixture of the three foods named. The experiment gives no conclusive data, as no mention is made of the percentage of dead to live weight, or of the quality of the meat.

The second experiment was carried out for the purpose of comparing the values of barley meal and maize in the fattening of pigs. In this case also six pigs divided into two lots of three were used. The experiment lasted 76 days. The first lot were given maize, potatoes and skim-milk; the second lot receveid barley meal and a similar addition of potatoes and skim-milk. The pigs in lot I. appear to have made a greater increase by 7 lbs. each than the barley-fed lot, but this small variation does not seem to have influenced the reporter greatly, since it is recorded that "the difference in the results from the two foods was so slight that it may be assumed that berley meal is as satisfactory a food for pigs as Indian meal, and it possesses the advantage that it can be produced on the farm".

Similar experiments having the same objects in view were carried out in Co. Cork, but the details given are fuller, and the number of pigs greater.

In the first of the two experiments, eight pigs were utilised; they were cross-bred Large Yorkshire pigs, presumably the offspring of a boar of this breed out of locally bred sows. The eight pigs were divided into two lots of four animals each. From November 12 to the beginning of February the first lot was fed on potatoes, barley and separated milk, while the second received potatoes, maize and separated milk.

The total increase in weight in the two lots was about the same, while the proportion of dead weight to live weight was 74 per cent. in the case of the first lot, and 75.4 per cent. in that of the second.

A second experiment was carried out, also with eight pigs; no separated milk was given, the animals being fed in the first case on potatoes and maize meal and in the second on potatoes and barley meal.

The daily increase of weight was larger in the pigs given barley meal. The animals showed a decided preference for the latter and would have consumed larger quantities of it than of maize meal. The subsequent examination of the meat showed that, as a rule, the flesh of barley-fed pigs is firmer and of better quality than the meat from pigs fattened on maize. Mention is also made of the fact that some of the pigs fed on maize meal suffered from so-called cramp (1), whilst those fed on barley meal were unaffected.

GOATS

1062 – **Tests of the Performance of Goats belonging to the Goat-Breeding Associations of Brüggen, Harsum, Schüttorf and Wessenstedt, Hanover.** VIETH in *Zeitschrift für Ziegenzucht*, No. 9, pp. 130-133; No. 10, pp. 149-151; No. 13, pp 200-203; No. 14, pp. 213-217. Hanover, May and July 1913.

These milking tests were begun in March 1911 and carried on with the assistance of the Prussian Ministry of Agriculture, Domains and Forests (Preussische Ministerium für Landwirtschaft, Domänen und Forsten). The number of goats tested was 10 for each Association. The first milking test was made 7 days after the kids were dropped, the others every 14 days until only half the goats were still milking. Three goats of each Association were milked three times a day, the rest three times at first, subsequently only twice. The Wessenstedt goats were all milked three times at first, and afterwards twice.

The yields of milk and of fat were determined. For the milk, the volume was determined and the specific gravity of 1.032 taken as a basis for the calculation of the weight. The butter yield was estimated by multiplying the fat content by 1.1.

The total results of the milking tests are given in table I.

TABLE I.

Breeding society	Breed	Number of times the animals had kidded	Length of observations days			Yield of milk lbs.			Fat content %			Butter yield: lbs.		
			Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Brüggen	Harz, fawn-coloured, hornless	2-10	280	308	291	1180.7	2031.0	1612.6	2.97	5.28	3.90	53.38	91.79	68.48
Harsum.		2- 7	255	315	296	1357.4	2501.2	1977.8	2.98	4.78	3.63	51.81	101.10	78.38
Schüttorf	Saane, white	3- 8	238	294	266	932.1	1580.0	1199.0	2.32	4.07	3.17	31.91	49.94	41.18
Wessenstedt. . .		2- 8	224	294	272	1324.0	2147.9	1712.0	3.11	4.36	3.54	52.86	81.61	66.30

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(1) In the countries of Southern Europe, where maize is fed on a large scale, it does not appear that this disease is of especially frequent occurrence. (*Ed.*).

These data show that the highest yields were furnished by an Association keeping Harz goats, and the lowest by an Association breeding Saane goats. On the other hand, if the total results are taken into account, it is clear that the Harz goats cannot be assigned a higher place than the Saane breed.

Table II gives the average milk and fat yield of the goats which were milked three times a day.

TABLE II.

Number of goats	Average milk yield: lbs.			Average fat content: %		
	morning	noon	evening	morning	noon	evening
12	3.21	1.82	2.16	3.22	4.28	3.64

As regards goats which were milked thrice daily, the decline in yield which occurred between the first and second series of observations, was in the proportion of 100: 82 in the case of milk, and of 100: 78 in that of fat.

In the case of the Wessenstedt Association goats, which were milked regularly thrice during the course of the first observations, and twice only during that of the second, the decrease in the yield of milk and fatty matter was in the proportion of 100: 85.

Table III gives the average production of milk and fatty matter on the different test days.

TABLE III.

Test day	Milk lbs	Fat %	Test day	Milk lbs	Fat %	Test day	Milk lbs	Fat %
1	7.3	4.906	8	7.0	3.481	15	4.4	4.217
2	7.9	3.962	9	6.6	3.441	16	4.2	4.051
3	7.7	3.578	10	6.2	3.204	17	3.7	4.233
4	7.9	3.549	11	5.9	3.333	18	3.3	4.394
5	7.9	3.403	12	5.7	3.427	19	3.1	4.450
6	7.5	3.525	13	5.3	3.771	20	2.6	4.989
7	7.3	3.672	14	4.9	4.023	21	1.8	5.040

Fig. 1.
Fowler-Wyles motor plough.

Fig. 2.
Petter's semi-Diesel engine.

ical stamina of the birds, but also their capacity for producing valuable feathers. All plucked feathers are roughly sorted on the farms by girls; they are then tied up in bundles weighing from half a pound to one pound and sent to New York, where they are dressed for the market.

As a result of his observations the writer was led to believe that large tracts of land in New South Wales would be eminently well adapted to the requirements of this industry.

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS

1064 - **Engines and Agricultural Apparatus Exhibited at the Show of the Royal Agricultural Society held at Bristol, 1913.** - *Engineering*, Vol. 96, Nos. 2480, pp. 18-22 and 40-44. London, July 4 and 11, 1913. - *The Engineer*, Vol. 116, Nos. 3001 and 3002, pp. 10-12 and 37-40. London, July 4 and 11, 1913. - *The Implement and Machinery Review*, Vol. 39, No. 460, pp. 505-551. London, August 1, 1913.

These three accounts contain detailed descriptions and figures of some of the exhibited agricultural machines which showed various innovations and improvements in their construction.

Especially worthy of note are the motor ploughs and traction engines of the following firms: Messrs. John Fowler and Co.; The International Harvester Company of Great Britain; Messrs. Aveling and Porter; Darly-Marshall Motor Plough Syndicate; Messrs. Marshall Sons and Co; Messrs. W. Forster and Co., and The Ideal Agricultural Motor Company.

Fig. 1 represents the newest type of the Fowler-Wyles motor-plough with a one-cylinder paraffin or petroleum motor. Fig. 2 shows a Petter 3-cylinder 150 H. P., Semi-Diesel engine.

Messrs. Davey Paxman and Co. exhibited gas engines. Oil motors were shown by Messrs. Brazil, Straker and Co.

Many milk separators and machines for food preparation were on view. Prizes were awarded for milking machines and sprayers. The first prize for the former was given to the "Amo" machine constructed by the Aktie-bolaget Mjolkningmaskin Omega, Flen (Sweden). The second was given to the milking machine of Vaccar Limited, London. Both these machines are Swedish inventions. The "Amo" is a suction machine. The tin vessel holding the milk is hung over the cow's back on an adjustable web band. It is to be noticed that the milk passes into the milk vessel through four celluloid, and not indiarubber, tubes. The milking machine exhibited by Vaccar Limited is worked by a pulsator.

Among the sprayers, the first prize fell to the "Green" powder sprayer of Messrs. Moellenkamp and Co., London, and the second to the "Pilter" powder sprinkler of Messrs. Pilter and Co., London.

1065 – **The Machines and Implements at the Exhibition of the German Agricultural Society at Strassburg, 1913.** - 1. KÜHNE, G. in *Maschinen-Zeitung*, Year 11, Nos. 13 and 14, pp. 153-161 and 166-172. – 2. PITTINS, F. *Ibid.*, No. 15, pp. 178-183. Berlin, July 1 and 15 and August 1, 1913. – 3. *Landwirtschaftliche Maschinen und Geräte*, Year 13, Nos. 22 and 23, pp. 15-35 and 15-23. Artern, May 31 and June 7, 1913.

The exhibition catalogue contained nearly 8000 exhibits, exclusive of those shown in the pavilions set apart for the chief and the preliminary trials (1). The number of exhibits being large, only some novelties are mentioned in this account. A turn-wrest plough with a new device for easy adjustment of the head, was exhibited by the plough maker I. G. Dobler of Landsberg. The Finnish firm of G. Svanljüng exhibited a new model of their harrow with rotating teeth (Rollspatenegge).

The ploughing machines were the centre of great interest, and were very numerous in view of the chief trial organised by the German Agricultural Society for motor ploughs during the current year. In order to facilitate inspection, these machines were divided into three groups according to their method of work, and regardless of the fuel used:

1. Mechanical ploughs on the winding drum principle.
2. Mechanical ploughs with direct traction.
3. Picking machines (Bodenfräsmaschinen).

The first group consisted of the steam ploughs of the firms A. Ventzki A. G. of Grandenz, John Fowler and Co. of Magdeburg, the Heilbronn Machine Manufacturing Co., and a plough drawn by a cable driven by an explosion motor, shown by the firm of F. Kners of Tegel. No electric outfits were exhibited.

A compound steam ploughing engine driven by super-heated steam with a boiler of a new construction was shown by the firm A. Ventzki A. G.; this machine, though it is rated by its constructors at 90 H. P. and can for a time attain 130 H. P., only weighs 13 tons. The decreased weight will facilitate the management of the machine. Its price is £ 1000. The same firm exhibited a steam balance plough with a subsoiler of a new type. Messrs. F. Kners of Tegel showed a mechanical plough worked on the two-engine system; these engines have four heavy wheels, can reverse, and have four cable speeds. The length of the cable is 1500 ft. The amount of benzol used in normal work is, according to the makers, 9 oz. per horse-power hour. The ploughing-tackle weighs 16½ tons and the total price is £ 1075.

The tractor ploughs were more numerous. In this class are included those machines in which the motor and the body of the plough are mounted on the same framework and those in which the plough is dragged by a separate tractor.

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(1) The machine trials organised by the German Agricultural Society on the occasion of these exhibitions fall into two classes, the chief and the preliminary trials (Haupt-und Vorprüfungen), of the new machines. The latter are placed in special pavilions called trial pavilions. (*Ed*).

A Stock motor plough in the chief trial pavilion showed many improvements upon the earlier types. Other motor ploughs exhibited were of the Wendeler-Dohrn type and those of the International Harvester Co. (Berlin) and the Holt Caterpillar Co. (Budapest).

The "Akra" plough of the "Aktien Maschinen-fabrik Kyffhäuserhütte" is of the Stock type but larger. The four-cylinder benzol motor has a stroke of 8 in., a cylinder diameter of 6 in., and a maximum force of 85 H. P. at 750 revolutions per minute. Its weight is 6 tons and its price £ 1000. A new liquid-fuel motor, used for the traction of ploughs or heavy loads, was exhibited by Messrs. John Fowler and Co. of Magdeburg. The weight of this is 9 tons and its catalogue price £ 1040.

The picking machines were represented by the exhibits of Messrs. Lang of Mannheim; the "Studiengesellschaft für Landbaumotoren" (Munich) and the "Siemens-Schuckert" Werke (Berlin). The "Lanz" machine of the Köszegi type is constructed on a new system. The four-cylinder benzine motor gives 60-70 H. P. with about 580 revolutions per minute. The "Factotum" machine of the Munich "Studiengesellschaft für Landbaumotoren" has a new type of roller. The latter carries 6 rows of pickers, which are not rigid, as in the case of the Lanz-Köszegi plough, but can revolve round a point. The price of this machine is £1250, nearly the same as that of the "Lanz" machine. The trials made with two Meyenburg system ploughs which were also exhibited proved very interesting. The smaller weighs 15 cwt.; it has a 10-12 H. P. motor and costs £250. The larger is of 25 H. P.

Amongst the other exhibits were numerous manure-distributors, charlock sprayers, thrashing machines and dairy machines and utensils.

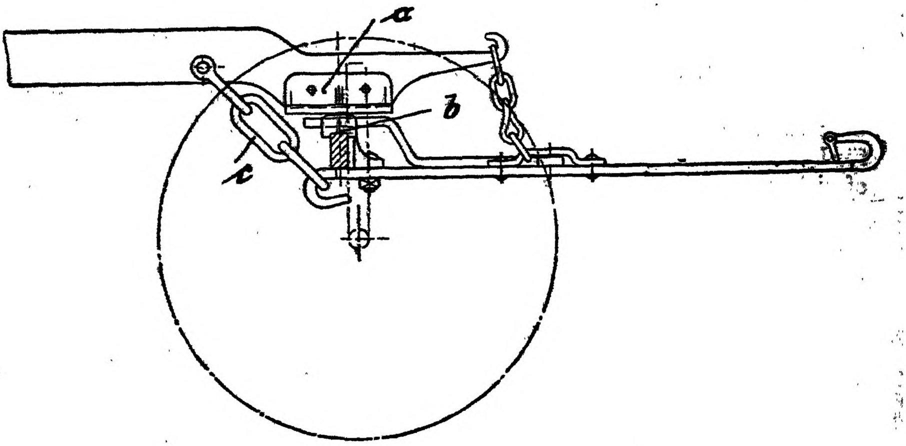
1066 - **Trial of a New Self-guiding Two-Wheel Plough with Subsoiler.** (Fortieth Report of the Machine-Testing Department of the Brandenburg Province Chamber of Agriculture). — FISCHER, G. in. *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten,* Year 7, Part 2, pp. 48-55. Berlin, 1913.

The plough described in this report was used on the estate of Dahlem near Berlin, on the Hellersdorf estate belonging to the city of Berlin, and on the Uetz estate (Osthavelland). During the time that this plough was used (1911-1912), the Department for Machine Testing had the opportunity of testing it more than once.

The new wheel-plough is chiefly characterized by a new appliance for self-guidance (see figure). The beam rests by means of a cast-steel plate (*a*) upon the saddle (*b*) of the axis of the fore-carriage to which it is attached by a short chain (*c*). The construction is such that the supporting plate, under the influence of the different degrees of resistance offered by the soil, can rise on the round saddle, while the chain placed beneath the beam obliges the latter to resume its former position. The speciality of the new plough is the simplicity of its construction. Another point in which it differs from ordinary wheel-ploughs is that a spring subsoiler is attached to the beam to break up the bottom of the open furrow. The mould-board of the plough must naturally be adapted to the soil conditions; that used during the trials was suitable to a moderately compact soil. The mould-board is made of soft steel. The wheels of the fore-carriage have replaceable boxes on the nave.

This new plough, of which eight have been made, costs, including coulter and reserve share, from £2.2s to £4.10s. Skim-coulter and subsoiler are reckoned separately; the first, with spare share, costs from 6s to 8 s 6 *d* according to the size of the plough; the price of the second, including the attachment, is from 10 *s* to 28 *s*.

As a result of the tests and a prolonged trial on the three above-mentioned estates, it may be said that the plough worked excellently, and when the right-sized machine was selected, it fulfilled all the demands made upon it. Particularly noticeable is the simplicity of its construction, the facility with which it is managed and guided, and also the fact that this plough also serves the purpose of breaking up the subsoil. Wheel-ploughs of this type have only been in existence a few years. In the new plough the subsoil share is narrow, as, in the opinion of the constructor, this type requires a minimum of traction force and has a better influence upon plant growth than a broad one. The truth of this statement is being tested in different places, but the experiments, which will extend over many years, are not yet finished.



Their results are, however, only of secondary importance as regards the judgment to be passed on the plough, for the advantageous nature of breaking up the subsoil has long since been demonstrated in many ways. As the transformation of the plough into a subsoiler only costs a few shillings, and the machine works equally well in both capacities, its technical perfection is already worthy of recognition.

1067 – **Reinforced Concrete Rollers for Use on Moorland Soil** (1). SIEGERT in *Der Kulturtechniker*, Year 16, No. 3, pp. 237-239. Breslau, July 1, 1913.

It is well known that rolling the soil has a great influence upon the yield of moorland crops and is especially important in laying down meadows and pastures. Unfortunately, rolling is too little practised and is sometimes entirely omitted. The reason for this is, almost invariably, the high price of an iron meadow roller. It is thus well to draw the attention of the agriculturists to rollers made of reinforced concrete, which they can construct themselves on the spot, selecting the weight most suitable for their purpose.

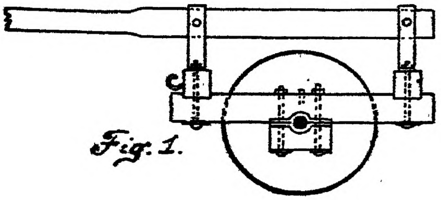


Fig. 1.

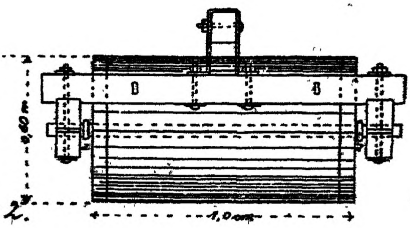


Fig. 2.

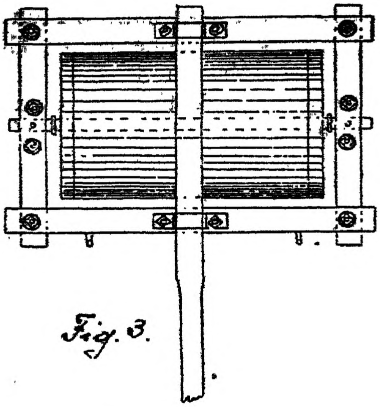


Fig. 3.

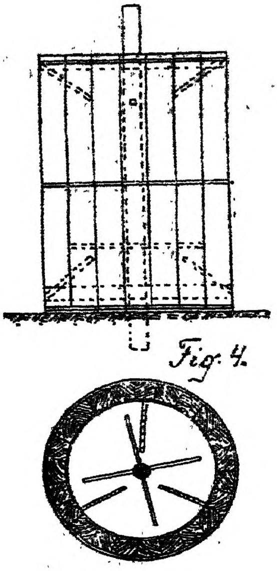


Fig. 4.

Figs. 1-3 give such a roller in side and front elevations and plan. A roller of this kind 3 ft. 3 in. wide weighs, without the iron parts and

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(Ed.).

shafts 1230 lbs. for a diameter of 24 in., 1700 lbs. for a diameter of 28 in., 2200 lbs. for a diameter of 32 in., and 2800 lbs. for a diameter of 36 in.

Construction of the mould and of the roller. — A circular piece of wood of the diameter of the roller is placed level on the ground. Through the centre is passed the axle, which must project 8 in, at each end beyond the cylinder of reinforced concrete. It may consist of an old cart axle, or of a cylindrical bar of iron, of 2-inch diameter. In order to ensure the adhesion of the cement to the axle, and to prevent the latter turning independently of the roller, it is transfixed, 16 inches from each extremity, by rods of iron which project perpendicularly; the middle of the axle is also notched. On the circle of wood an iron hoop of the same diameter as the roller is placed. This hoop protects the edge of the latter; it is furnished internally with three twisted bands of flat iron penetrating obliquely into the mass of concrete. Vertical lathes are now nailed all round the wooden bottom, or else are bound round it with wire. On the upper portion of the cylinder formed by the lathes, there is placed inside a second iron hoop similar to the first and 3 ft. 3 in. from it; this is fixed to the lathes by iron wire so that it cannot shift. After the axle has been centered exactly, the mould (fig. 4) thus prepared is ready for filling in the concrete. The concrete should be made with as little water as possible, using 1 part of cement to 3 or 4 parts of washed gravel.

The concrete must be rammed in in layers of about 8 inches, and the ramming of each layer should go on till water appears on the surface. The mould being thus filled, it is left in the shade for two or three weeks, care being taken to water it frequently. At the end of this time, the wires and lathes are removed, the surface is smoothed over with cement, and subsequently the concrete roller is laid on its side. Then follows the construction of the deal frame, shown in figs. 1-3.

A roller of 24 inch diameter and 3 ft. 3 in. long costs, when made on the spot, £3 15 s. A long roller is unsuitable for moorland soil, owing to difficulty in turning.

1068 - **Trial of an Eight-Foot Grass-Mower.** — NACHTWEH, A. (Ninth Report of the Testing-Station for Agricultural Implements and Machines, at Hanover) in *Mitteilungen des Verbandes Landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 2, pp. 71-83. Berlin, 1913.

In fig. 1 the grass-mower is represented as seen from above, and in fig. 2 the side view is given; the drawings are to scale. *H* is the lever wich raises the carrier of the finger-bar, which is released by the spiral spring *f*. The lever, *G*, serves to fold back the mowing apparatus upon itself, while *K* represents a foot-lever which can be used simultaneously for the same purpose. The finger-bar is 8 ft. long and has 31 fingers in 10 sections.

In fig. 3 the mower is drawn as seen from behind; this shows in particular the shoe *N*, at the end of the finger-bar; by means of a prolongation, *I*, the shoe can easily be taken hold of to help in raising the finger-bar.

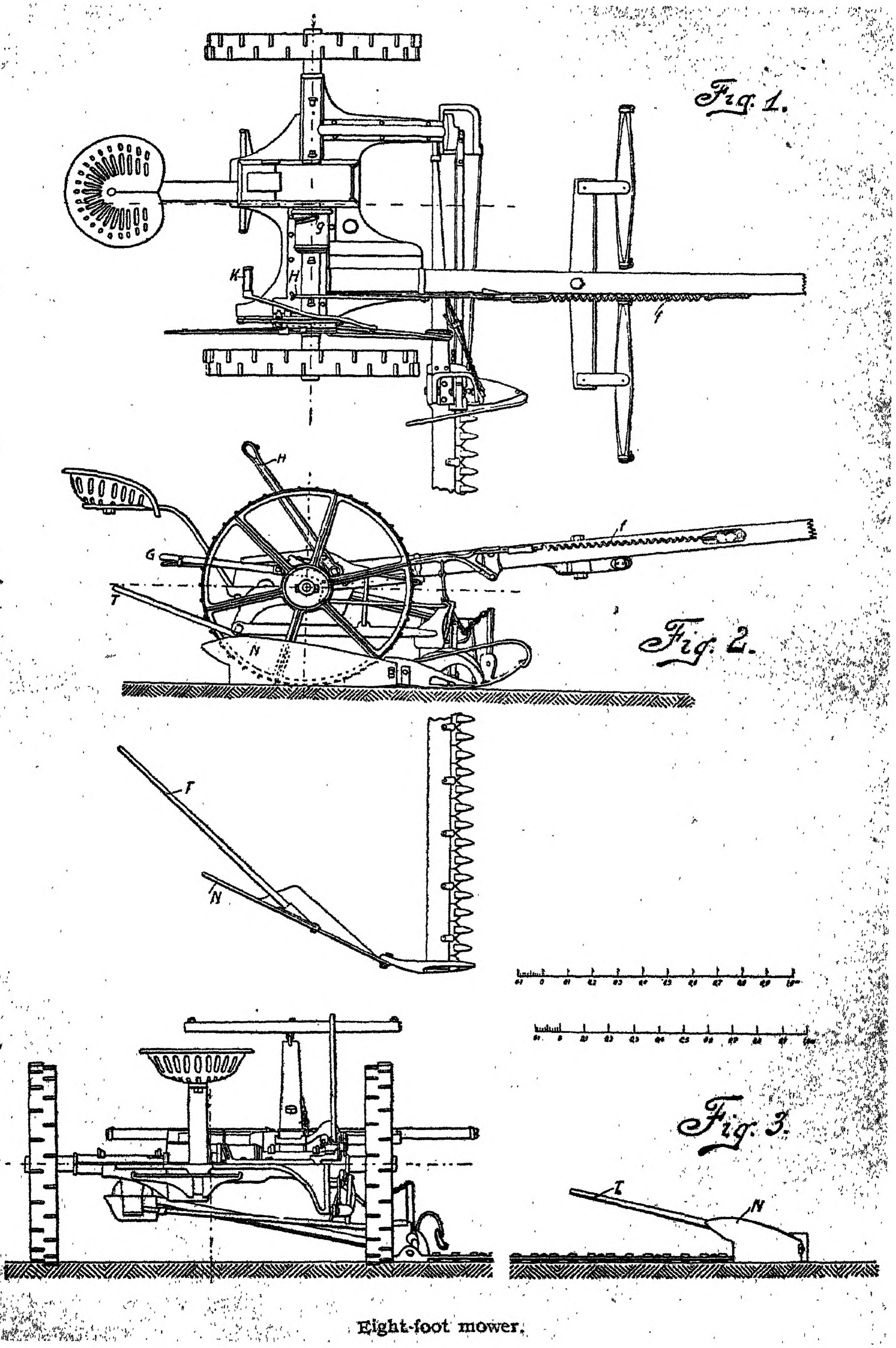


Fig. 1.
g
K
H
f
H
G
T
N
f
Fig. 2.
T
N
Fig. 3.
T
N

Eight-foot mower.

Owing to its great length, the finger-bar would be apt to bend a little; this is obviated by its being bent slightly upwards in such a manner that when in a horizontal position, it becomes perfectly straight through its own weight. In order to give great stability to the mower, the wheels are placed very far apart and the gear for working the knives is situated between the two wheels.

This machine was tested on the meadow of Empelde near Hanover, and many agriculturists made the first and second cuts with it. They seemed very satisfied with the work of the mower, and were especially impressed by the large amount of work it performed, and its light running. The official trial was made in a field at Empelde belonging to Hr. Fricke, many measurements being taken and dynamometric experiments carried out. Longer tests were effected to decide the two following points.

1. The force expended in traction.
2. The adaptability to slopes.

The results obtained in both cases were excellent. The writer gives tables showing the width of the cutting and the amount of traction force required. The blade was examined as regards its cutting diagrams (Schnittdiagramme) according to the Nachtweh method.

The mower weighs 760 lbs. and costs £22.

The conclusions drawn from the trial are as follows: as a result of the many tests made during the summer of 1912, this machine may be regarded as completely fulfilling all practical requirements; it is very light, possesses great stability and does a large amount of work.

1069 – **Trial of an Automatic Feeder for Threshing-Machines.** — NACHTWEH (Tenth Report of the Testing-Station for Agricultural Implements and Machines, at Hanover) in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 2, pp. 83-86. Berlin, 1913.

The trial in question took place on the 5th of April 1913 on the Gehrdts estate at Appensen, near Bevensen. The automatic feeder was fixed to a threshing-machine whose drum was 67 inches in length and 16 $^3/_4$ inches in diameter. The chief part of the feeder is a toothed revolving shaft; it bears arms carrying at their extremities two angle irons situated somewhat apart from each other. The teeth are fixed alternately on these angle irons and pass though slits in the sheet iron cover, which is supported by two braces. The quantity of sheaves taken up by the toothed rotating shaft is regulated by special fingers.

Owing to the late date only rye and wheat were available for threshing. In a trial with rye, the amount threshed in a quarter of an hour was observed; this was 757 lbs. of grain, which would mean about 38 bushels (of 56 lbs.) per hour. Wheat was then tried; in one hour 45 $^3/_4$ bushels (of 60 lbs.) were got through. As the guaranteed average output is 25 to 30 bushels per hour, the trial may be considered satisfactory.

The working of the automatic feeder is also excellent. The examining committee was satisfied that the amount of grain threshed was in no way diminished by using it, so that it may be considered altogether satisfactory.

Before a final judgment is pronounced on the thresher and feeder, it is intended to submit them to extensive trials with various cereals this autumn.

1070 - **Drill for Beet Seed.** (German patent No. 251-386). — *Blätter für Zuckerrübenbau*, Year XX, No. 12, pp. 188-189. Berlin, June 30, 1913.

The usual drills for sowing beet seed in clusters are not well adapted for sowing on the ridge, as the clusters frequently fall off the comparatively narrow crest of the ridge into the furrows. For this reason the subject of the present patent is provided with a coulter, in front of the sowing funnel, which traces a flat-bottomed depression along the crest of the ridge, ready for the seed to fall into.

Fig. 1.

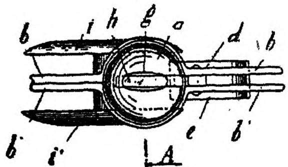


Fig. 2.

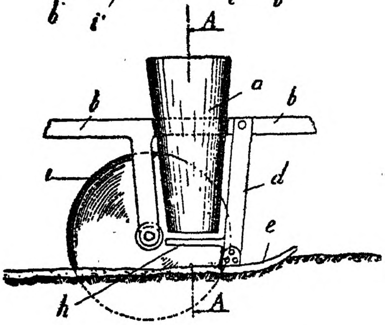


Fig. 3.

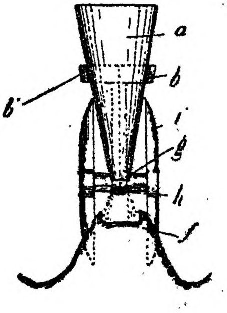
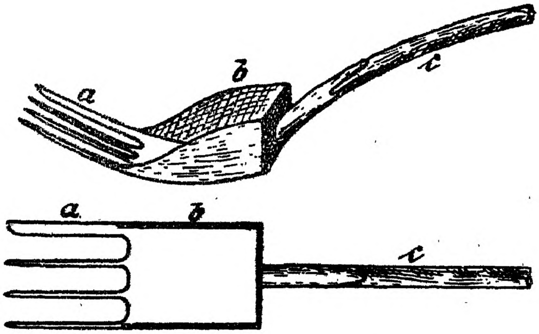


Fig. 2 gives a side view of the apparatus, and figs. 1 and 3 views from above and in front (partly in section). Between the two supports (bb') of the funnel of the distributor (*a*) is the stanchion (*d*) which supports the coulter: this is about 2 inches wide and bent back to give a flat bottom; it leaves a flat-bottomed depression (*f*, fig. 3) into which the seeds fall.

The distributor (*h*) is situated below an oval opening (*g*) in the bottom of the funnel, and is supported by the stanchion (*d*). To prevent the seeds getting too much scattered, or carried away by the wind, two revolving discs (*i i'*) may be fixed on, one on either side of the funnel.

1071 - **Combined Fork and Shovel.** — DE CONDÉ, G. in *Journal d'Agriculture pratique*, Year 77, Vol. II, No. 28, p. 57. Paris, July 10, 1913.

The handling of litter of very short material with a fork is an awkward job: this is so with very short straw, peatmoss, sawdust, leaves, weeds, etc. On the other hand, the wooden shovel used for sawdust will not do for other material used to replace straw as bedding.



These difficulties are done away with by using the combined fork and shovel shown in the figure. This tool, which is easily made, is a four-pronged fork, with the right hand prong (*a*) generally wider than the others. The back part is solid and forms a shovel (*b*) with a handle (*c*). The length of the prongs may be varied.

1072 - **Trial of the Lawrence-Kennedy-Gillies Milking Machine at the Live Stock Institute at Reggio Emilia (Italy).** — CUGNINI, A. in *L'industria lattiera e zootecnica*, Year XI, Nos. 8-13, pp. 132, 152-153, 168-169, 185 and 200-203. Reggio-Emilia, April 15, May 3 and 19, June 1 and 15 and July 15, 1913.

The trial of the above machine was carried out in 1912 under directions from the Ministry of Agriculture. The writer first gives an outline of the development and working of mechanical milking apparatus. The machines belong to two groups, milking respectively by suction and by pressure: the former imitate the action of the calf's tongue in sucking, the latter the action of the milker's hand. The principle machines of the first group, which include a suction-pump worked by a motor of about 2 H.P., are:

Lawrence-Kennedy-Gillies.
Burrell-Lawrence-Kennedy.
Max.
Wallace (1).
Dana.
Thistle.

Those of the second group, in which pressing parts do the work, are:

Alfa-Dalen.
Loquist.
Sans-Rivale.
Galakton (2) (3).

The trials, made on ten cows divided into two lots of five, were intended to examine the following points:

1. Fixing and working of the machine.
2. Influence of mechanical milking on the health of the animals.
3. Completeness of the action.
4. Quality and quantity of the milk.
5. Time required for milking and manual labour involved.
6. Cost of installing the machine.
7. Hygienic qualities of the milk.

Besides these two lots, which were used specially to determine the effect of mechanical milking on the quantity and quality of the milk, some other cows were machine-milked.

The experiments were divided into a preliminary period of 30 days, to fix the rations, the weight of the animals and the milk-yield, and an observation period of four months, in which the cows of lot I were machine-milked and those of lot II hand-milked as control.

The writer gives details as to the rations, and then turns to the working and manipulation of the machine.

The apparatus is accurately and strongly constructed; during the whole trial period none of the metal parts got out of order, and the only parts requiring renewing were some of the rubber tubes. The handling of the apparatus is very simple. With regard to the health of the cows, there was nothing unusual to report.

The completeness of the milking has a marked influence on the quality and quantity of the milk, as well as on the occurrence of affections of the udder. Tables given by the writer show the details of this. It appears that between the 1st of July and the 15th of October the total amount of milk drawn by the machine was 9 967.5 lbs., while the amount milked by hand to complete its work was 766.1 lbs. or 7.14 per cent. of the total yield. The data on the quantity and quality of the milk are also given in a table. In the preliminary period the yield of the two lots per head per day was almost equal, namely 27.90 and 27.24 lbs. In the experimental period the average yield of lot I was 20.98 lbs., as compared with 19.93 lbs. for lot II. The time taken to milk each cow was 15 minutes with the machine, as against 8 minutes by hand.

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(1) See No. 170, *B.* Feb. 1913. (*Ed.*).

(2) See No. 169, *B.* Feb. 1913. (*Ed.*).

(3) Further information on these milking machines, as well as on the "Revalo", "Bergner Revalo", "Andersen-Schmidt", "Delta", etc., may be found in the following publications: *L'Industria lattiera e zootecnica*, No. 17, 1912; NELLO FOTTICCHIA "La mungitura meccanica", *Ibid.* 1909-10; *Deutsche Landwirtschaftliche Presse*, 1909, 1911, 1912; *La Vie agricole et rurale*, 1912; *Journal d'agriculture pratique*, 1910, 1911, 1912; *Bulletin de la Société des agriculteurs de France*, 1912. (*Author's note*).

The following table shows the cost of installations:

For	60- 80	cows, with	3	pulsators	. . . .	£ 120
»	80-100	»	» 4	»	. . . .	» 150
»	100-130	»	» 5	»	. . . .	» 195
»	130-160	»	» 6	»	. . . .	» 225
»	160-180	»	» 7	»	. . . .	» 255
»	180-200	»	» 8	»	. . . .	» 290

After treating at length of the milk, the writer sums up his conclusions as follows.

1. The working of the apparatus presents no difficulty, and its manipulation is easy.

2. Almost all cows allow themselves to be milked without difficulty from the first; only a few need a short time to get accustomed to the method.

3. The milking machine in question had no deleterious action on the general health of the cows; two of them showed slight hardening of the hind quarters of the udder, but this soon went off.

4. The apparatus did not milk dry, and hand stripping was necessary in every case.

5. Machine milking, supplemented by hand stripping, had no appreciable depressing influence on either the quantity or the quality of the milk.

6. For all the cows, machine milking was slower than hand milking.

7. It appears that on large dairy farms the number of milkers can be reduced by using several of these machines; but the total number of hands required seems hardly to be lessened.

8. The expenses incurred in machine milking are certainly not lower than with hand milking.

9. To obtain proper hygienic conditions in the milking, scrupulous cleanliness in the apparatus is essential.

1073 - **Milking Machines: Effect of Machine Method of Milking upon the Milk Flow.** — SMITH, G. A. and HARDING, H. A. — *New York Agricultural Experiment Station, Bulletin* No. 353, pp. 327-361. Geneva, N. Y., November 1912.

The Burrell-Lawrence-Kennedy milking machine has been in use at the New York Experiment Station since 1907 and has been continuously tested against hand milkers by dividing the herd as far as possible into two equally productive halves, and subjecting each cow alternately to hand and to machine milking during her successive lactation periods. The milk flow is subject to so many fluctuations that the results cannot be taken as in any way conclusive, but so far as they go they do not indicate any depressing effect on the yield by the use of the machines, and two cows, one small teated and the other very hard milking, which could not be milked by hand, gave satisfactory returns with the machine. It was calculated that one man with two machines could attend to 15 cows.

1074 – **Improved Universal Desiccator for Drying Potato Slices, Beet Leaves, Cereals, Beet Seeds, etc.** – VOSS, H. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 55, pp. 672-673. Berlin, July 9, 1913.

With the present desiccators, not only potatoes, mangolds, cereals, beet-seeds and peas can be successfully dried, but also beet leaves, potato haulm, etc.

The best and most extensively used are the drum desiccators with rotatory mechanism in which hot gases straight from the generators can be used for drying.

The drum desiccator of the "Tätosin" system, thanks to the removable revolving apparatus in the interior of the drum, can be employed for drying every kind of agricultural and industrial product, provided that the latter is suitably prepared. The apparatus (figs. 1 and 2) consist of a revolving cylinder, in which perforated cups (A) are placed one above another. These cups possess movable perforated lids (B) through which the substances to be dried find their way from the outer zone to the middle of the drum and back. This is of great advantage in ensuring equal drying and permitting the utilization of the hottest gas given off by the generators.

Product	Fuel used	Temperature of the gases		Speed of hot air in the drum in ft. per second
		on entering C.	on leaving C.	
1. Potatoes with 18 % starch	Coke only	550	200	3.3 – 3.6
2. Beet leaves reduced to one-fifth of their weight when dry	Coke and anthracite	580	180	1.65 – 1.95
3. Cereals (decrease of humidity 5 %)	»	180	40 – 45	1.0 – 1.15
4. Beet and other seeds . .	»	170	35 – 38	0.9 – 1.0
5. Beet slices	»	520	180	3.3 – 3.6

Numerous experiments have been made for the purpose of determining the best temperatures and speeds of the hot air in the case of different products; the results are given in the table.

Fig. 1.

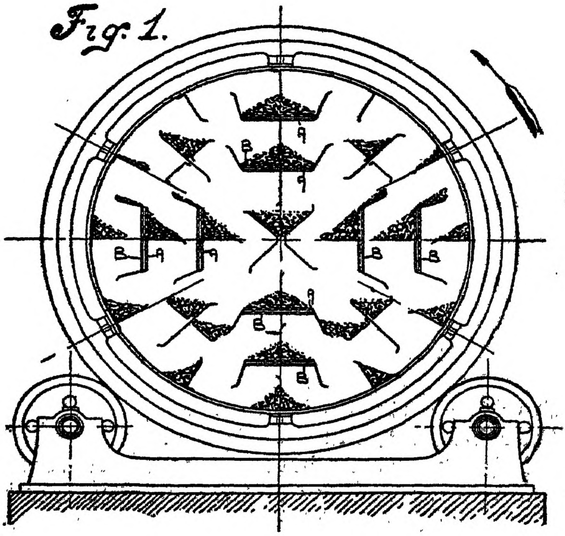
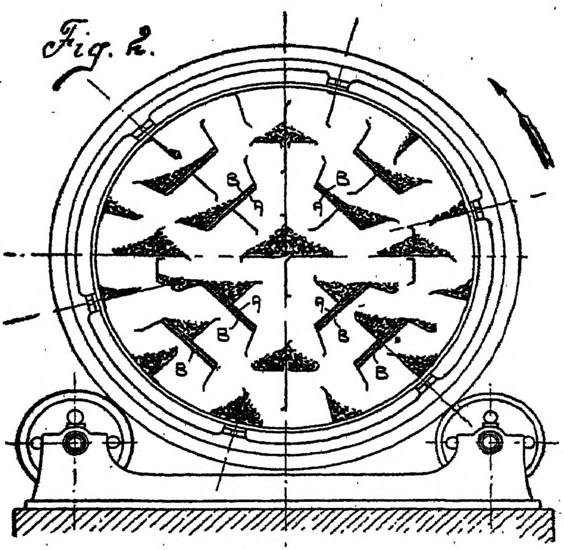


Fig. 2.



The universal desiccator is provided with a regulator placed beneath it. The mechanism which revolves the drum allows of a variation in the number of revolutions from 3 to 12 per minute, in order that the rate of the passage of the substance in the machine may be proportional to its moisture-content. This is effected by multiple pulleys. On leaving the drum, the dry material is cooled in a cooling compartment and after having passed through a sorting sieve, can at once be placed in sacks and stored.

Sorting the dried substances is indispensable in the case of leafy substances, to which soil adheres during growth and gathering, in order that no particles injurious to animals may be left in the dried fodder.

This universal desiccator is made in different sizes and for different purposes.

1075 – **New Pump for Farm Work.** — MONIN in *Vie à la Campagne*, Vol. XIV, No.163, p. 29. Paris, July 1, 1913

This pump is distinguished by its extreme simplicity, by the facility with which it can be set and by its perfectly uniform action.

It consists, as may be seen from the annexed figures, of a cylindrical body closed on two sides by plates, one of which bears the suction pipe and the other the forcing pipe. Within the body revolves another cylinder, in each of the faces of which a deep groove is cut at right angles to the one at the other end, and a block of metal like a water-tight piston slides in each of the grooves. These blocks are traversed and driven by two diametrically opposed excentrics fixed on the driving shaft, which occupies a slightly excentric position towards the axis of the cylindrical body of the pump.

Fig. 1 is a section of the apparatus showing the arrangement of the working parts. Fig. 2 is a perspective view of the movable parts. Figs. 3 to 7 show the successive positions taken up by the several pieces during one complete revolution of the driving shaft. Fig. 8 shows the pump without the front plate and fig. 10 the body and the working parts separately.

1076 – **Review of Patents.**

Tillage implements and machines.

261 745 (Germany). Spring-bolt regulator for lateral displacement of double- furrow balance ploughs.
261 940 (Germany). Tractor for common ploughs.
60 719 (Austria). Motor plough.
1 067 111 (United States). Plough.
1 067 068 (United States). Plough attachment.
1 067 065 (United States). Harrow.
1 066 323 (United States). Plough and cultivator.
453 081 (France). Agricultural tractor.
455 362 (France). Regulator for ploughs.
6 361 (England). Traction engines.
7 814 (England). Harrows.
131 522 (Italy). Improvements in mechanical ploughing tackle.
131 440 (Italy). New system for mechanical ploughing and cultivation.
131 836 (Italy). Arrangement for simultaneous ploughing and harrowing.

Fig. 1.

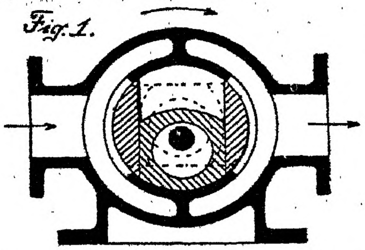


Fig. 2.

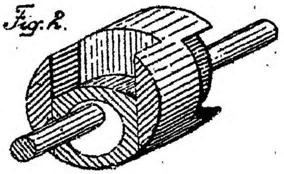


Fig. 3.

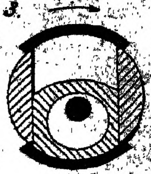


Fig. 4.

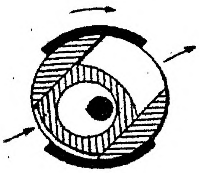


Fig. 5.

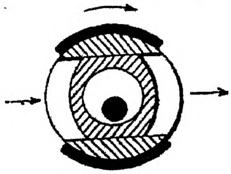


Fig. 6.

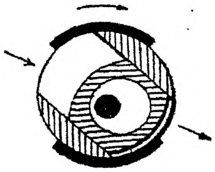


Fig. 7.

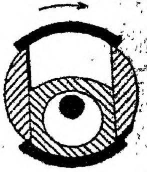


Fig. 8.

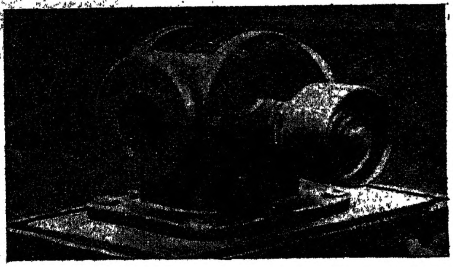
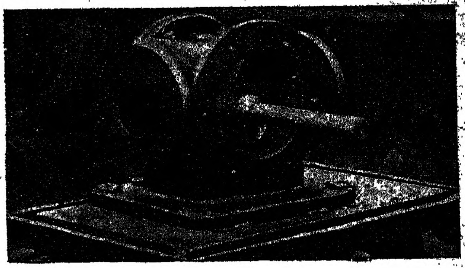


Fig. 9.



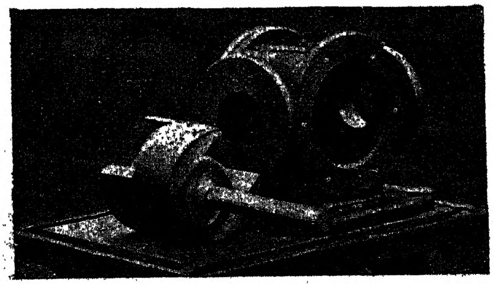
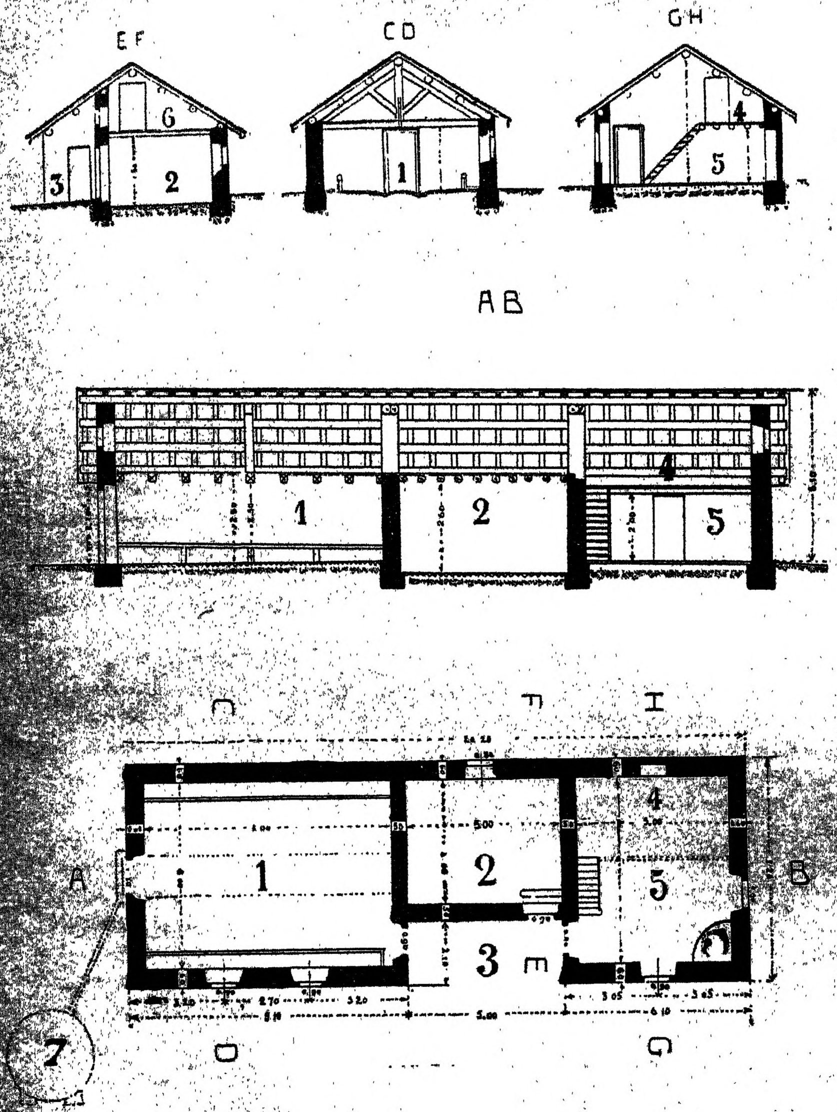


Fig. 10.


E F
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Alpine cheese-shed.

1. Cow-shed.
2. Cheese room.
3. Porch.
4. Sleeping-room.
5. Kitchen.
6. Sleeping-room.
7. Manure pit.

N. B. — The measurements are in meters: 1 meter = 3 ft. 3 in. (very nearly).

60 912 (Switzerland). Mechanical cultivation outfit worked by electric motor.
60 913 (Switzerland). Grass harrow.

Manure distributors.

261 566 (Germany). Manure distributor with distributing axle in the hopper.
453 043 (France). Manure distributor for vineyards.
455 416 (France). Portable manure distributor with fans.

Drills.

261 614 (Germany). Drill with agitating wheels and distributing surfaces in conjunction with them.
453 961 (France). Drill.

Reapers and mowers.

261 747 (Germany). Arrangement for converting a mower into a reaper.
261 748 (Germany). Rotary cone-shaped ear-separator for reapers.
60 654 (Austria). Reaper with discharging rake.
1 065 946 (United States). Mower attachment.
453 538 (France). Lawn mower improvements.

Machines for lifting root crops.

261 978 (Germany). Potato lifter, in which the potatoes are carried into a revolving sieve drum, which also acts as the driving wheel.
453 371 (France). Potato lifter.

Threshing machines.

261 895 (Germany). Short-straw sieve for threshers.
1 066 024 (United States). Thresher-Cylinder.
131 595 (Italy). Improvement of the beaters in threshing machines.

Other agricultural machines and implements.

261 750 (Germany). Milking machine, in which the caps consist of one fixed and one movable part.
60 661 (Austria). Knife-sharpening machine.
60 773 (Austria). Transplanting apparatus.
1 066 467 (United States). Hay-press.
453 326 (France) Cereal weed-sprayer, for use with sulphuric acid.
6 281 (England). Cow-milkers.
131 624 (Italy). Continuous-action drier with automatic delivery, for cereals and other materials.
60 695 (Switzerland). Drier for grass and cereals.

BUILDING-CONSTRUCTION

1077 – **Alpine Cheese Shed.** – *Il Caseificio moderno*, Year 6, No. 14, pp. 216-217. Piacenza, July 15, 1913.

This building, designed for the Alps, is intended to arrange under one roof, in a simple and economical manner, a room for treating the milk, a room for ripening the cheeses, a shed for the cows and accommodation for the hands.

In the accompanying plate, the three upper figures show sections through EF, CO and GH of the plan (lowest fig.): the middle figure is a longitudinal section along AB. The scale is 1: 100.

The cow-shed is 8 meters (26 ft. 2 in.) long and can hold 16 to 20 cows; it is connected with the manure pit by a gutter. The cheese-room has a north window and is sunk a few steps so as to keep it cooler and at the same time to allow more space for the sleeping-room above; in front of it is a wide porch, which keeps off sun and rain.

The back part of the kitchen is boarded off at 6ft. 6in. from the floor to form another sleeping-room, to which a wooden step-ladder gives access; there is a door between this and the central sleeping-room. The roof is very simple. The total cost of the building is about £ 196.

RURAL ECONOMICS.

RURAL CONOMICS

1078 - **The Problem of Encouraging a Fresh Development of the Agricultural Production of Germany.** - 1. VON LOCHOW. Landwirtschaftliche Produktionssteigerung auf der bisherigen Fläche. — 2. BESELER. Landwirtschaftliche Produktionssteigerung durch Vermehrung der Kulturfläche. — 3. SERING. Landwirtschaftliche Produktionssteigerung durch innere Kolonisation. — *Archiv des Deutschen Landwirtschaftsrats,* Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council, Feb. 11-13, 1913) pp. 53-77. Berlin, 1913.

1. From 1885 to 1889 the mean production of cereals in Germany was 1195 lbs. per acre, while from 1905 to 1909 it was 1624 lbs.; the increase in twenty years has thus been 36 per cent. During the same period the yield of potatoes rose from 9010 lbs. to 12400 lbs. per acre. Von Lochow refers to the data of his own farm to show that this production could be considerably increased by suitable systematic selection, based on yield, and this apart from any increase due to heavier manuring or better cultivation. He shows how this method has been applied to rye, and quotes the results obtained with both rye and oats.

If Germany's rye crop were increased by 10 per cent., the increase in the agricultural production involved would be worth nearly £ 400 000. Similar results could be obtained with wheat, barley, potatoes, sugar-beets and in particular green crops.

The production of live stock would also be considerably increased by the adoption of selection based on productivity. The writer illustrates this point by reference to figures from the Milk Control Societies compared with those from uncontrolled cows; it appears that an average increase of 50s per head of dairy cattle can readily be obtained, giving £ 27 000 000 for 11 million animals. The poultry industry, too, might give far larger yields by the adoption of proper selection. But to get small farmers in particular to take up this question more than they have done so far requires educational work : this could best be accomplished by arranging peripatetic lectureships.

2. Beseler deals with the increasing of the German production by extending the area under cultivation. According to Fleischer's calculations there are 8.7 million acres of waste moorland in Germany which might be brought under cultivation and yield three-quarters of a million tons of meat a year, without reckoning other produce; this area could support 70 000 families on holdings of varying extent. Taking the ton of meat at £ 40, the extra production obtained would be worth something like 30 millions sterling. The writer dwells briefly on the progress realized in the cultivation of moors and sandy heaths, and estimates that the

capital required to bring such land in Germany under cultivation is about 100 millions; this would be well spent, as it would give an increase of the total production of the country, and further would contribute to the development of certain industries, in particular to that of chemical manures, as these would be required for the extra cultivated area.

3. Home colonisation aims at the most intensive utilization possible of the available land. Its economic task is to increase the bulk of the agricultural production. Dr. Sering shows that home colonisation fulfils this aim not only as regards the products of live stock — in peasant properties of 12 to 50 acres there are 30 head of large stock per 100 acres as compared with only 14 on large holdings of over 250 acres — but also for field produce. Dr. Keup and Richard Mührer have determined the average increase of production due to home colonisation in East Prussia with as much accuracy as possible (1). Their results show that the stock of horned cattle has doubled or even tripled in a few years, while the number of pigs has tripled or quadrupled. The farms are now regularly distributed over the whole area, allowing all parts to be intensively cultivated: the difference between fields round the steading and distant ones has disappeared, and the rotation is thoroughly adapted to local soil conditions. Labour is both more abundant and better suited to the requirements than previously, for at the busy seasons of seed-time and harvest all the members of the family can help. As the amount of dung available in the new colonies is two-and-a-half or three times as much as before, and the use of chemical manures has not fallen off, it is quite natural that the production has increased considerably. The dividing up of the land among the peasants has led to an extension of cereal-growing; as a result of this, in the Pomeranian colonies the production of grain has doubled in ten years, while in those in Neumark it has become half as large again. In spite of the increased home consumption, the amount of produce sent away from the colonies is greater by 40 to 140 per cent. than that from the original farms. The writer estimates the area capable of division into small peasant holdings in East Prussia (excluding the province of Posen) at 6 100 000 acres. But large properties whose owners possess the intelligence, knowledge and energy required to apply the results of technical and scientific progress to them, should be preserved as agricultural models for the small holders.

1079 - **The Agricultural Conditions of the Province of East Prussia.** — HANSEN in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 21, pp. 241-249. Hanover, May 23, 1913.

According to the 1907 statistics of professions, out of the 2 003 339 inhabitants of East Prussia, 1 028 608, or 51.3 per cent., were engaged in agriculture; for the whole Kingdom of Prussia the average agricultural population is only 27.4 per cent., while in the Province of Saxony it is 25.7 per cent. and in the Rhenish Province as low as 16.9 per cent.

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(1) ERICH KEUP and RICHARD MÜHRER. Die volkswirtschaftliche Bedeutung von Gross- und Kleinbetrieb in der Landwirtschaft. Berlin: Parey, 1913.

(Author's note).

East Prussia, forming a part of the lowland plain of Northern Germany, is largely low-lying, and it is only here and there, particularly in the south of the Province, that ranges of hills reaching 1000 ft. occur. In general light sandy soils prevail in the south, while more or less heavy loams characterize the lower ground in the north.

The climate is severe; the mean temperature from December to March is below 0°C. (32° F.). Except for a narrow littoral belt, the Province has a markedly continental climate, with great contrast between the heat in summer and the cold in winter, which is often very severe: the summer maximum is over 30° C. (86° F.) and the winter minimum below — 20° C. (— 4° F.). Owing to the short vegetative period, spring work on the land has to begin very late, while in autumn work is stopped early.

The means of communication and transport, which were formerly very difficult, have been much improved recently by the opening of State and secondary railway lines, which have greatly facilitated the disposal of agricultural produce. In this way East Prussia has been brought into much closer contact with the western markets, as is evident from the equalization of prices between Eastern and Western Germany. In the decade 1861-70 the price of a ton of wheat in Rhenish Prussia was 27*s* 6*d* higher than in East Prussia, while for rye it was 34*s* higher; in 1901-05 these difference were respectively 8*s* 8*d* and 10*s*. Between 1861-70 and 1900-05 the price of beef rose 29 per cent. in Rhenish Prussia and 72 per cent. in East Prussia.

The total area is 9 150 000 acres; the number of farms is 219 245. The 1907 statistics give the following data on the distribution of the land among the holdings of different sizes:

Classification according to size	Percentage of number of farms				Percentage of area farmed			
	East Prussia	Province of Saxony	Rhenish Prussia	Kingdom of Prussia	East Prussia	Province of Saxony	Rhenish Prussia	Kingdom of Prussia
Under 5 acres	52.2	69.5	70.9	61.8	2.2	6.5	11.9	4.8
5-12½ acres.	14.9	10.9	15.4	15.3	4.3	6.7	20.0	8.1
12½-50 acres.	20.1	14.3	12.3	17.1	17.6	26.7	44.6	27.7
50-250 acres	11.3	4.8	1.3	5.2	38.8	34.1	20.3	31.3
Over 250 acres.	1.5	0.5	0.1	0.6	37.1	26.0	3.2	28.1
Over 500 acres.	—	—	—	—	28.2	19.5	0.5	22.6

Thus over a quarter of the area under cultivation consists of properties of over 500 acres, while farms of under 50 acres (the first three classes) do not make quite a quarter. The efforts towards changing this proportion in favour of the smaller holdings by means of home colonization are centred in the East Prussian Rural Association (Ostpreussische Landgesellschaft); this body, up to the end of 1912, had started 1221 new independent farms of various sizes, but all less than 125 acres.

The farmers of East Prussia rent only 5.9 per cent. of their land, as compared with 13.3 per cent. for the whole kingdom and 20.5 per cent. for the Province of Saxony. Out of every 100 strictly agricultural holdings in East Prussia, 87 are owned by their occupiers and 8 others are half owned.

The 1900 statistics show the following utilization of the land:

	Province of East Prussia — per cent	Kingdom of Prussia — per cent
Arable and garden land	55.3	50.7
Meadow	11.2	9.4
Pasture	6.9	5.9
Forest and copse	17.4	23.7
Space occupied by houses and yards, wastes, roads, streams, etc.	9.2	10.3

The arable and garden land is divided as follows:

	Province of East Prussia — per cent	Kingdom of Prussia — per cent
Cereal and pulse crops	57.2	61.6
Hoed crops	10.2	17.6
Industrial crops	0.4	0.6
Green crops	12.9	9.5
Temporary grassland	7.6	5.1
Fallow	10.8	4.2
Gardens and fruit plantations	0.9	1.4

The reason for the smallness of the area devoted to hoed crops and the size of that under fallow is to be sought in climatic conditions; the intensive cultivation of green crops and the high proportion of temporary grassland show that live stock is of great importance in East Prussia.

In the last few years a great number of permanent improvements have been made; drainage has made great progress, and much activity is being displayed in the reclamation of marshes and the laying down of permanent pastures. The use of chemical manures is increasing rapidly, both on arable land and on permanent grassland.

The rotations at present followed in East Prussia are based on an improved extensive culture rotation of arable land and leys (geregelte Feldgrasswirtschaft); they may be called modified four-course rotations.

Climatic and economic conditions combine to make East Prussia specially suitable for live-stock raising. The live-stock census figures for 1873 and 1911 are as follows:

	Province of East Prussia			Kingdom of Prussia		
	1873	1911	Difference	1873	1911	Difference
			per cent.			per cent.
Horses	350 478	489 655	+ 40	2 282 435	3 171 579	+ 39
Cattle	785 646	1 204 889	+ 53	8 639 514	11 682 234	+ 35
Sheep	1 841 437	379 879	— 79	19 666 794	4 372 489	— 78
Pigs	463 718	1 489 292	+ 221	4 294 926	17 244 855	+ 302

The breeding of horses in East Prussia is famous throughout the world. Almost all the breeding of pedigree half-bloods is carried on by the peasant-proprietors, who use the mares for field work and put them to State stallions. The foals are sold to larger proprietors who have at their disposal the wide extents of pasture necessary for rearing them. For some time the breeding of heavy horses has also been undertaken in East Prussia; the stock was built up from Belgians from the Rhine Province.

Cattle have developed enormously: East Prussia now forms a field of intensive breeding of the Black-and-white Lowland breed; this will be further encouraged by strong Herdbook Societies, Control Societies and Breeders' Associations.

All the measures tending to the encouragement of agriculture spring either from the Chamber of Agriculture for the Province of East Prussia or from the three Central Agricultural Societies; the latter, with 350 affiliated societies, number some 20 000 members.

Agricultural education is imparted by the Agricultural Institute of the Royal University of Königsberg, by two Agricultural Colleges, 19 winter agricultural schools, two institutes for dairy instruction, and one school each for domestic economy, meadow cultivation and horticulture. The directors of the winter schools also act as peripatetic instructors in agriculture, as do five live stock instructors, one poultry inspector, one dairy instructor and three fruit inspectors.

Land credit is undertaken by the "Ostpreussische Landschaft"; credit for agricultural improvements is provided by the auxiliary Provincial Pay-Office. There are three great Cooperative Unions; besides them there are numerous coöperative dairies, and associations for sale and purchase, producers' associations, etc. The Cooperative Book-keeping Association of Königsberg occupies a place by itself; it was founded in 1904 at Insterburg, and now closes the books of about 150 farms.

1080 – **Difference in the Returns of two Dairy Farms and its Causes.** — WÜSTENDÖRFER, KURT. Zur Frage der Rentabilität der Abmelkwirtschaft. — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 56, pp. 516-518. Berlin, July 12, 1913.

The writer calculates the utilization value of the unmarketable food consumed by the milch cows on two dairy farms in which no breeding is carried on, and from this draws inferences as to their returns.

Farm A is close to a large town on the Rhine. Its area is 445 acres; in 1911 there were 68 acres under sugar-beets and 25 acres under mangels. There is no permanent grassland. Consequently there is a plentiful supply of fresh and ensilaged beet slices and leaves, but little hay. The feeding is not excessive.

Table I shows the purchase and sale price of the cows, their depreciation and the length of time they were kept.

TABLE I.

Year	Purchase price		Sale price		Depreciation per cow		Three-year averages of depreciation		Length of time kept
	£	s	£	s	£	s	£	s	
1906	28	5	24	4	4	1	—		10.8
1907	25	5	21	10	3	15	4	1	11.2
1908	24	2	20	8	3	14			11.8
1909	24	1	19	7	4	14			10.5
1910	26	7	21	4	5	13	4	13	11.1
1911	27	2	23	9	3	13			11.9

The average sale price reckoned has been increased by the amount of the losses by death and diminished by the amount received by sale of calves.

The average milk-yield per cow in 1911 was 1104 gallons. The average price made by the milk was 1*s* per gallon (1*s* 1*d* for milk in bottles, 1*s* in cans and 9 ½ *d* and 9 *d* for large orders). The cows are mostly bought in full milk, rarely just after calving. Purchase and sale are carried out through an agent. The cows are not put to the bull. In 1911 the average herd was 88 head (mostly black-and-white East Friesians). The cows are attended to by five men and a woman. The distribution of the milk is done by six carts.

The expenses for 1911 were as follows:

	£	s	d
Attendance	389	2	3
Rent of stable (£1225 at 6 %)	97	10	0
Utensils (£150 at 6 %)			
Lighting (petroleum) £. 15			
Fire insurance	1	7	6
Interest on capital in cows (£2385 at 4 %)	95	8	0
Interest on working capital (£6 2*s* 6*d* per cow, at 4 %)	21	11	3
Veterinary attendance and medicine	24	10	0
Depreciation of cows	321	15	3
Administration expenses (accounts, offices and manager)	101	14	6
Sale expenses	937	5	0
Expenses of collecting debts	11	15	6
	£2001	19	0
Concentrated foods	1507	15	0
	£3509	14	0

Against this there is the sum of £ 4874 13*s* 9*d* by sale of milk.

The calculation of the value of the food consumed was made according to Brinkmann's formula:

$$F = \frac{V - (G - g) P}{g}$$

F is the feeding-value of 1 kg. (2.2 lbs.) of starch value in the home-grown produce to be used as the basis of the ration; *V* is the utilization value of the food; *G* is the total content of the ration in starch values, *g* the content of the basal food in starch values; *P* is the average price of 1 kg. of starch value over all the concentrated foods. (*G-g*) *P* is therefore the purchase price of all the concentrated food, *i. e.* £1507 15*s*; *V* is the revenue from the sale of milk less the cost of production (leaving out the concentrated foods), *i. e.* £4874 13s 9*d* - £2001 19*s*. The total content of the basal food in starch values is £ 4672 12s. We thus get:

$$F = \frac{\text{£}4874\ 13s\ 9d - \text{£}2001\ 19s - \text{£}1507\ 15s}{4672.6}, = 0.2921\ s\text{, or about } 3\tfrac{1}{2}d.$$

The basal food for 1911 should therefore be valued as follows:

			£	s	d
Total basal food			1365	3	6
Hay (2 tons 7 cwt)	per	ton.	4	10	3
Oat straw (43 tons 16 cwt.)	»	»	2	9	6
Chaff, half wheat, half oats (29 tons 4 cwt.)	»	»	3	17	0
Mangels (285 tons 14 cwt.)	»	»		18	3
Wet beet-slices (181 tons 11 cwt.)	»	»		14	6
Beet-slice silage (80 tons 3 cwt.)	»	»		19	0
Beet and mangel leaf silage, half-and-half (468 tons 13 cwt.)	»	»	1	5	3
Green rye (2 tons 2 3/4 cwt.)	»	»	1	12	9
Green maize (50 tons 2 cwt.)	»	»	1	6	6

The utilization value is thus highly satisfactory.

Farm *B* has an area of 315 acres and is 17 ½ miles from the same town; the milk is sent three-quarters of a mile by road and the rest by rail to a milk-seller. The cows, mostly East Friesians, are bought from a dealer, generally lately calved and rarely in full milk. The average number in the herd is 54. Table II shows the average purchase and sale prices, and the depreciation per cow.

TABLE II.

Year	Purchase price		Sale price		Depreciation per cow		Three-year averages of depreciation	
	£	s	£	s	£	s	£	s
1898-1899	20	2	15	19	4	3	3	16
1899-1900	20	1	16	13	3	4		
1903-1904	21	15	18	7	3	4	4	4
1904-1905	22	16	17	7	5	10		
1905-1906	23	2	19	8	3	14		
1906-1907	26	1	19	11	6	10	6	12
1907-1908	26	1	19	13	6	8		
1908-1909	25	7	18	9	6	18		
1909-1910	25	18	17	14	8	4	7	1
1910-1911	27	5	19	15	7	11		
1911-1912	27	7	22	0	5	7		

The cows are not put to the bull. The average milk yield per cow in the last year was 1122 gallons. The feeding is rather heavy, as each cow gets about 16 lbs. of concentrated food per day, summer and winter. The animals are looked after by a cowman and his son and two daughters.

The valuation of the food consumed by the cows on farm *B* is shown in Table III.

TABLE III.

Year	Receipts from sale of milk		Receipts from sale of fat cattle		Value of milk consumed in the house (1.1 gallon per day)		Total receipts		Labour		Cost of milch cows		Concentrated food		Rent of stable and dairy (£ 400 at 6 %)
	£	s	£	s	£	s	£	s	£	s	£	s	£	s	£
1898-99	1 071	11	877	7	10	15	1 959	12	150	9	1 226	1	664	15	24
1899-00	1 092	13	816	2	11	12	1 920	7	150	9	862	8	686	17	24
1903-04	1 297	16	1 028	11	11	12	2 337	19	150	9	1 436	14	654	15	24
1904-05	1 391	1	1 005	0	12	11	2 408	12	168	6	1 117	11	765	12	24
1905-06	1 620	15	1 337	19	12	11	2 971	5	168	6	1 617	5	960	7	24
1906-07	1 730	4	1 173	12	12	11	2 916	7	183	2	1 613	11	1 026	9	24
1907-08	1 805	7	902	17	13	9	2 721	13	189	13	1 300	19	1 007	8	24
1908-09	1 942	7	905	2	13	9	2 860	17	189	13	1 318	17	1 218	18	24
1909-10	2 026	10	1 169	8	13	9	3 209	7	189	13	1 658	16	1 134	12	24
1910-11	2 062	3	1 149	18	13	9	3 225	9	183	15	1 526	19	1 318	3	24
1911-12	1 954	2	1 363	11	14	15	3 332	9	183	15	1 723	15	1 302	11	24

(1) As the figures for the fixed items are rounded up, the sums of the items do not exactly agree with the

These figures show that the utilization value of the home-grown food (clover, beet leaves and chaff) is small. In five of the years, fairly evenly distributed over the period under consideration, this value is a negative quantity, or in other words the full interest on the live and dead stock is not paid. This shows that if certain conditions are not fulfilled, the returns from this type of dairy farming may be small, in spite of large receipts from the sale of milk.

The great difference in the returns from the two farms is attributed by the writer to the following circumstances: The favourable return from farm *A* is due to the small amount of the depreciation per cow, the judicious use of concentrated foods, the moderate intensity of feeding and the gain from retailing the milk. As the total expenses of retailing were 2.57 pence per gallon and the difference between the retail and wholesale prices was 3.22

TABLE III.

Interest, amortization and upkeep of utensils		Lighting (electric from 1908)	Administration: £ 15 Vet. and medicine: £ 6	Interest on capital in cows		Interest on working capital		Interest, amortization and upkeep of horse and cart		Carriage of milk		Total expenses (1)		Value of foods		Three-year averages of value of foods	
£	s	£	£	£	s	£	s	£	s	£	s	£	s	£	s	£	s
4	0	3	21	42	1	10	12	17	18	26	17	2 189	11	—229	19	— 74	11
4	0	3	21	38	11	10	12	17	18	26	17	1 839	10	80	16		
4	0	3	21	49	6	10	12	17	18	26	17	2 397	8	— 59	9	69	13
4	0	3	21	42	9	10	12	17	18	26	17	2 200	4	208	8		
4	0	3	21	59	2	10	12	17	18	26	17	2 911	5	60	0		
4	0	3	21	55	15	13	5	17	18	26	17	2 987	16	— 71	9	— 7	11
4	0	3	21	44	2	13	5	17	18	26	17	2 650	19	70	14		
4	0	5	21	44	10	13	5	17	18	26	17	2 882	15	— 21	17		
4	15	5	21	56	11	13	5	17	18	26	17	3 151	4	58	3	12	18
4	15	5	21	53	9	13	5	17	18	26	17	3 193	18	31	11		
4	15	5	21	61	15	13	5	17	18	26	17	3 383	9	— 51	0		

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totals in this column, exceeding them by about 23 s. (*Ed.*).

pence, the gain on retailing is 0.65 of a penny; on a yield of 1104 gallons this means a yearly gain per cow of £3. The unfavourable results of farm *B* are attributable to the large depreciation per cow and the heavy bill for concentrated foods. The small amount of home-grown food should be noticed in this connection: ensilaged beet-leaves were first used in 1909-10 and then only in small quantities, while mangels are quite lacking. This increase in cost of food brings only a slight saving in labour. It is thus seen that along with the price made by the milk the personality of the farmer is a primary determining factor in the profitableness of the concern; the more he possesses the qualities necessary for the head of such a farm, namely sound judgment for the animals he purchases, ability in dealing and the capability of fixing on technically sound rations, the better will be the results of his dairy farming.

1081 - **Collective Renting of Farms.** — Rambaud in *Annales de l'Ecole Nationale d'Agriculture de Grignon*, Vol. 3, pp. 107-135. Paris, 1912.

Collective renting has been practised in Italy for some twelve years. The chief object of the system is to do without the middleman (gabellotto), to whom small tenants had formerly to apply, by taking on leases of farms and land direct by means of a cooperative renting association; a further idea is to obtain at any rate a partial remedy for the unemployment occurring at certain seasons, by bringing waste land under cultivation and introducing intensive methods.

In Upper Italy there are at present 22 of these renting associations, cultivating, 17 400 acres; in Sicily there are 43, with 62 962 acres. The land rented may be farmed either collectively or separately by the members of the cooperative association.

In 1907 there were 106 such associations in Rumania, with 14 000 members cultivating 188 000 acres and paying an annual rent of £93 000. In 1909 the number had increased to 300, with 445 000 acres rented for nearly £200 000. The land is divided among the members in holdings not exceeding 25 acres, and varying according to the working capacity of the member's family.

Collective renting is also practised in Bohemia (among the Czechs), Hungary and Servia. The writer discusses the results obtained in Italy, and expresses the hope that this system may be introduced into France.

1082 - **Efforts towards the Economic and Social Improvement of the Conditions of the Agricultural Labourers.** — Von Batocki in *Archiv des Deutschen Landwirtschaftsrats*, Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council, Feb. 11-14, 1913), pp. 137-146. Berlin, 1913.

The writer believes that the best means towards reducing rural depopulation and creating and maintaining a fixed class of agricultural labourers is to improve economic and social conditions in the country. This would involve: extension of the area cultivated by labourers, as far as this is possible; making stock keeping possible (milch cows and breeding of small stock); utilization of animal products by cooperative means; wages in kind; arranging of winter work (forestry work and home industries); technical instruction; adoption of profit sharing; better instruction of the women in domestic economy; regularization of the relations between the employer and his men.

AGRICULTURAL INDUSTRIES.

DAIRYING

1083 - **The Calorific Value of Milk in relation to its Price and its Nutritive Value.** — Ascetti, G. in *L'industria lattiera e zootecnica*, Year XI, No. 12, pp. 183-184. Reggio-Emilia, June 15, 1913.

The idea that a knowledge of the butter-content of milk is sufficient indication of its value, and often also of its purity, is the foundation of the commercal valuation of this article and is also relied upon in most municipal regulations for the control of milk. The adoption of this criterium gives rise to differences of opinion and scientific and legal criticisms in prosecutions for fraud made by the public authorities against dairies; and this result is quite natural, as it is only in such cases as butter factories, in which the fat is the only ingredient required, that the method is sound. With milk for use in cheese-factories, or as human food, it is not feasible to leave out of account the other constituents, especially the casein and the lactose. Experience has shown that the milks richest in fat do not necessarily give large and high-class products; and it often happens that a lack in fat is made up by abundance of protein.

All these considerations serve to explain why search has been made for other methods, as simple and exact as possible, for valuing and comparing milks for industrial use and for food. Dr. F. I. Herz, Government inspector of cheese-factories at Munich, describes one of these methods in two pamphlets ("Milch, Butter, Käse" and "Die Milch und ihre Erzeugnisse für die Volksernährung", Berlin, 1913); it consists in the determination of the calorific energy in 100 grams of the milk. This energy is believed to be proportional to the nutritive value of the milk, which should be taken as the basis of its trade value.

Dr. Herz gives tables for the determination of the calorific energy from the specific gravity and the fat content. He arrives at this by calculating the solids not fat, using Vieth's relationship between the constituents and taking the number of calories developed by one gram of protein, sugar and fat.

When the fat and specific gravity of a milk have been determined, the solids not fat may be ascertained by using the following formula:

$$S.N.F. = \frac{g + 1}{4} + \frac{f}{5}$$

in which g = the excess of the specific gravity over 1 multiplied by 1000, and f = the percentage of fat. Thus, a milk with S. G. 1.0315 and fat 3.6 per cent., would have solids not fat:

$$S.N.F. = \frac{31.5 + 1}{4} + \frac{3.6}{5} = 8.84$$

Applying Vieth's relationship, that is the proportion sugar : protein : ash = 13 : 9 : 2, the percentages of sugar and protein would be respectively 4.83 and 3.31. To get the calorific value (Wärmewert) these figures must be multiplied by the number of calories that one gram of each of the substances will produce on combustion, namely 4.1 for proteins and sugars and 9.3 for fats.

All these calculations have been reduced to one simple formula:

$$S.N.F. = g - 1 + 10\,f.$$

For a milk of S. G. 1.032, containing 3.6 per cent. of fat, we have:

$$S.N.F. = 32 - 1 + 36 = 67$$

According to Dr. Herz, milks with normal proportions of fat, protein and lactose have a calorific value of between 65 and 70. The writer considers the method very ingenious and also trustworthy, seeing it is based on positive experimental data regarding all the useful components of the milk.

The use of this figure for judging the purity and goodness of milk involves no addition to the work of analysis, as the specific gravity and fat content are always determined in milk control; it has the advantage of referring the whole to a single figure, which varies within very narrow limits, for it is well known that though one constituent of milk may show considerable deviations from the normal, these are generally balanced by the other constituents. When these figures are fixed for any given milk-producing district, the characters will be readily recognized and can form the basis for municipal regulations for fixing the type of milk in the district.

The figures may also be used for selecting the best milch cows, as well as for the selection of milks for rearing infants by hand.

1084 – ***Micrococcus mucofaciens,* New Bacterium of Ropy, Slimy Milk.** – THÖNI; J. in *Schweizerisches Zentralblatt für Milchwirtschaft,* Year II, No. 29, p. 230. Brugg, July 17, 1913.

This new bacterium which has been isolated from commercial milk by the writer, if cultivated in pure cultures on gelatine, causes a sterilized milk to become ropy at normal temperatures after 18 to 42 hours and alters it to such an extent that under an upper thick layer of cream a yellow brownish slimy layer is formed; this is thin at first but gradually grows thicker; under these two layers there is one of creamless milk apparently sound. At 35° C. the milk becomes slimy after 14 or 16 hours. In order to destroy this micro-organism it is sufficient to heat the milk to 70° C. for five minutes; treating the milk with 1 per cent. of milk of lime for half an hour has the same effect.

1085 – **The Classification of Lactic Acid Bacteria.** — GORINI, COSTANTINO in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten,* Vol. 37, No. 17-21, pp. 452-460. Jena, May 1913.

The writer criticizes the principles according to which the lactic acid bacteria have been hitherto classified and he expresses the opinion that this classification should be based especially on the physiological characters and not exclusively upon the morphological ones.

The principal points to which he has for many years successfully devoted his attention are the following: Behaviour of bacteria at different temperatures, rapidity of coagulation, duration of the vital period, gas-producing, caseolytic and acidifying power, and characters of the products of caseolysis.

1086 – **Preparation and Use of Yoghurt.** — WIEGERT, ELISABETH in *Molkerei Zeitung,* Year 23, No. 28, pp. 326-328. Berlin, July 12, 1913.

The writer describes the virtues of Yoghurt (curative properties for diseases of the liver and kidneys, disinfectant power and favourable action on animal metabolism).

She next states as the result of numerous experiments, that the preparation known in trade under the name of « Yoghurt-Maya-Ferment » and most of the dry preparations are not satisfactory for making Yoghurt, and lastly she describes a process both simple and economical for preparing Yoghurt in the household.

1087 - **Factors influencing the Change in Flavour in Storage Butter.** — ROGERS, L. A., BERG, W. N., POLTEIGER, C. R., and DAVIS, R. T. — *U. S. Dept. of Agriculture, Bureau of Animal Industry, Bulletin* No. 162, pp. 69. Washington, April 1913.

The influence which organisms exert on the odour of milk, cheese and other products of the dairy suggests a similar explanation of the changes which take place in stored butter.

Jensen has shown that under certain conditions bacteria do multiply in butter and have a direct influence on the flavour of the product. The writers have found no evidence of bacterial growth under normal conditions in their samples of butter, but have noticed a small multiplication of torula at high temperatures. In these cases there was no apparent relation between the growth of torula and the change in flavour. Moreover the same changes took place in duplicate lots of butter at temperatures so far below the freezing point that there could be no possibility of growth. The writers point out that the salt content of American butter is equivalent to an aqueous solution of 18 % or more, a concentration sufficient to prevent or at least retard bacterial growth, whilst that of European butter is considerably less. This led them to suggest the possible influence of lipolytic enzymes, but it was found that butter may show a marked change in flavour without any appreciable hydrolysis of the fat. There remained the possibility of proteolytic enzymes and of chemical changes of an oxidative nature. The presence of water bacteria and the proteolytic enzyme of milk known as galactase would favour proteolytic changes in butter. Other investigators had already shown that under comparatively high temperatures and low salt concentration the butter proteins undergo changes.

The present work is concerned with investigation into the influence of low temperatures and high salt concentrations on the activity of galactase in butter made from pasteurised and unpasteurised cream. The writer found that the ordinary method of determining the extent of proteolysis were not sufficiently delicate and were influenced by such factors as salt content on the precipitability of casein.

They therefore devised a method of removing considerable portions of the fat and casein by a system of decantation previous to applying the chemical methods of estimating the hydrolysed proteins. They found this method much more delicate in its results and showed that proteolysis did not take place to any appreciable extent in either pasteurised or unpasteurised butter, nor was there any relation between the figures for nitrogen and the butter scores.

Only in the presence of very large amounts of strongly active proteolytic enzymes, did they find hydrolysis to occur under conditions of cold storage and high salt content, and there is no reason to suppose that such amounts of enzymes are ever found in butter.

The possibility of the action of enzymes liberated by the death of bacteria was then investigated.

They found that whilst there was a marked difference in the rate of deterioration in the raw cream butter and the pasteurized cream butter the reinoculation of the cream with bacteria had little or no effect on the keeping quality of the butter.

The investigations on the oxidation effect of included air were not conclusive. The authors found no alteration in the carbon dioxide content of the enclosed air, but a decided decrease in the oxygen content. as if part of this gas had been removed. It still remains to be proved that the oxygen was actually removed by some butter constituent. The results showed that butter contains about 10 % by volume of gases.

The effect of metals on butter.

The influence of iron was first investigated and it was found in general that a relatively small part of the iron present in cream goes into the butter as compared with the butter milk, which seems to take most of the iron, and in which the presence of a flavour due to the iron was most noticeable. Various quantities of iron as ferrous sulphate were added to pasteurised cream and the resulting butter was scored for flavour at different periods. It was found that the butters with the added iron showed much quicker deterioration than the control butters. Below a certain point of deterioration differences were not recognisable. The control butters were the last to develop a " fishy" flavour and a most noticeable feature was the development of a very oily flavour as a stepping stone to the " fishy ".

Similar experiments were conducted using copper sulphate and similar results were obtained as in the case of the iron salt.

The deteriorating effect of copper was very pronounced in the case of butter made from cream pasteurised in a copper vessel, the tin coating of which had been worn away. The contact was only for a few seconds, yet a very decided fishy flavour developed in 30 days, whereas control butter from a tin-lined pasteuriser remained quite good. Copper would appear to be more powerful in its effects than iron.

The difference in the absorption of iron by cream in contact with the rusty and clean metal appeared to be insignificant, provided the butter was made under similar conditions. The precise nature of the action of these metals on the cream and butter is not definitely known, but it is supposed that it is of the nature of a catalytic agent in an oxidising process. Experiments lead the writers to believe that the lactose may be oxidised by an organic peroxide in the presence of iron, but further work is necessary before definite conclusions can be drawn.

It was found that no change took place in the lactose content when iron was added to milk containing 18 % sodium chloride even though a current of oxygen was passed through for 72 hours.

Iron salts (particulary ferrous) produce very strong odours when added to milk as the distillate from such milk gave very pronounced iodoform tests. Whether the small amounts of iron ordinarily present in butter

(0.089 %) can slowly bring about the same kind of change that larger amounts of iron bring about in milk in a very much shorter time is to be determined by future investigation.

1088 - **The Manufacture of Cheese from "Heated" Milk** (1). — Benson, M. and Evans, R. H. in *The Journal of the Board of Agriculture*, Vol. XX, No. 4, pp. 281-301. London, July 1913.

In 1905 a number of cheddar cheeses were made at the British Dairy Institute, Reading, with milk heated to temperatures of from 150° F. to 180°F. The heating took place in a steam jacketed cheese vat, and an ordinary Lawrence cooler was used for the subsequent cooling. On the whole, those cheeses made from the milk heated to below 165° F. were a success, while those made from milk heated above that temperature were not, being bitter, too moist, and faulty in texture. In 1909-10 a further series of experiments was carried out. In this case the heating was done out of contact with the air in a jacketed cylindrical copper vessel with a tightly fitting lid, and a current of carbon dioxide gas was passed through the milk. The cooling was effected by running cold water through the jacket. A temperature of 210° F. was adopted and great difficulty was experienced in making the cheeses: the coagulation was bad, the curd would not part with its whey, and seemed to have lost its adhesive properties. As a result the cheeses were moist, granular in texture, with a tendency to fall apart and crack, slightly bitter, and inclined to develop a blue mould inside; in other words, though intended for cheddar cheese, they resembled more closely the Wensleydale variety.

In 1912 special apparatus was installed for heating and cooling the milk rapidly out of contact with the air. It consisted essentially of a pasteuriser and of a Lawrence cooler covered in with movable top and side plates, and included also a so-called "retainer" or large drum in which the hot milk might be stored or "retained" if required. During the months of June to August 10 trials were carried out. On each occasion 600 lbs. of milk were employed and divided into 3 equal portions; one of these was untreated and acted as control, another was subjected to rapid pasteurisation and cooling, and the third was also pasteurised and cooled, but in addition a stream of carbon dioxide was passed through the pasteuriser at the rate of about ½ lb. to 200 lbs. of milk. The temperature of pasteurisation varied from 160° F. to 200° F. in the different trials. Subsequently to treatment, each lot of milk was made into cheddar cheese and all the details of the manufacture are given in a table from which the following figures have been extracted:

In general it may be said that pasteurised milk required less starter than raw milk except when heated above 190° F. but about twice as much rennet for coagulation. As in previous trials the curd was always softer and had a tendency to retain the whey; also it lacked coherence and required more pressure during the pressing stage as well as very secure bandaging.

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(1) See No. 867, *B*. July 1913. (*Ed*.).

Date of manufacture	Number of cheese	Milk heated to		Quantity of rennet used	Acidity in whey from press	Total solids in whey from vat	Max. pressure	Weight of cheese when matured		Points awarded by judges
								3 months	7 months	
1912		Deg. F.		Dchms	% lactic acid	%	cwt.	lbs.	lbs.	%
June 6.	1	84°	—	6 ⅓	1.15	5.88	10	19	17 ½	84
» 6.	2	160°	—	13	0.94	6.23	15	19	17	93
» 6.	3	160°	CO_2	13	0.935	5.90	15	18 ½	17	93
» 13.	4	86°	—	6 ⅓	1.08	6.97	10	19	16 ½	63
» 13.	5	165°	—	14	1.15	8.07	15	18 ¾	17	94
» 13.	6	165°	CO_2	14	0.915	7.05	15	19	17 ½	94
» 20.	7	84°	—	6 ⅓	1.14	5.55	10	19	17 ½	79
» 20.	8	170°	—	14	1.10	6.83	20	19	17 ½	100
» 20.	9	170°	CO_2	14	1.08	5.96	20	19 ¼	17 ½	93
» 27.	10	85°	—	6 ⅓	1.15	7.71	10	19 ¾	18 ½	78
» 27.	11	175°	—	14	0.95	7.08	20	21	18	82
» 27.	12	175°	CO_2	14	0.98	6.77	20	21	18	89
July 11	13	84°	—	6 ⅓	1.03	7.1	10	18 ½	17 ½	87
» 11	14	180°	—	14	1.00	6.97	20	19 ½	18	83
» 11	15	180°	CO_2	14	0.88	6.67	20	19 ½	18	96
» 12	16	84°	—	6 ⅓	0.95	7.08	10	18	17	91
» 12	17	185°	—	14	1.11	7.05	20	18 ¾	17 ½	47(1)
» 12	18	185°	CO_2	14	0.89	6.85	20	19 ¼	17 ½	48(1)
» 18	19	84°	—	6 ⅓	1.15	6.84	10	18 ¾	18	85
» 18	20	185°	—	14	0.91	7.27	20	20 ¾	20	72
» 18	21	185°	CO_2	14	0.72	6.70	20	21 ½	20 ½	82
» 25	22	85°	—	6 ⅓	1.19	9.40	10	19	19	99
» 25	23	190°	—	14	1.17	6.70	25	20 ¾	19	66
» 25	24	190°	CO_2	14	0.935	6.80	25	20 ¾	19 ½	94
August 1	25	84°	—	6 ⅓	1.02	8.01	10	20	19	86
» 1	26	195°	—	14	0.81	6.85	25	21 ¾	20 ½	83
» 1	27	195°	CO_2	14	0.60	7.00	25	22	20 ½	79
» 2	28	85°	—	6 ⅓	0.99	7.14	10	20 ¾	19 ½	98
» 2	29	200°	—	14	0.80	6.97	25	22 ¼	22	89
» 2	30	200°	CO_2	14	0.80	6.20	25	23	22	87

(1) The poor results obtained in these 2 cases were due to faulty manufacture.

The whey from the treated milk presented the desirable green colour and contained a lower percentage of total solids than that from the untreated owing to the precipitation of the albumen in the curd; this was specially noticeable when high temperatures were employed. To ensure equal salinity the pasteurised cheeses invariably required less salt than the unpasteurised ones, and the former matured more slowly and exhitited remarkable keeping qualities; they also gave more even results and were less liable to taint. Owing to the retention of the albumen by the curd, the treated cheeses were on the whole somewhat heavier than the untreated, the difference amounting to from 5 to 9 per cent. The carbon dioxide distinctly improved the coagulating properties of milk at the lower temperatures, but its effect was hardly noticeable above 180° F.; it also appeared to prevent bitterness, but had a deteriorating effect on the colour of the cheeses.

Two experts were appointed to judge the cheeses and, excluding the results of July 12th, the pasteurised cheeses with and without carbon dioxide scored a total of 807 and 762 points respectively, while the controls only scored 759. The pasteurised cheeses were specially successful when the lower temperatures were employed and some first class cheeses were obtained under these conditions, their moist character giving them a very rich appearance; even with the higher temperatures, they scored a high percentage of points, the loss of points occuring chiefly on account of their mild and somewhat undeveloped flavour.

MEAT INDUSTRY

1089 - **Twelve Months' Meat Supply of the United Kingdom (1911-12).** — TURNBULL, R. E. in *Live Stock Journal*, Vol. LXXVIII, No. 2052, p. 119. London, August 1, 1913.

For the purpose of this account the term "meat" includes home-fed fat cattle, veal calves, fat sheep and lambs, bacon and pork pigs, and imported fat cattle and sheep and imported beef, veal, mutton, lamb, bacon pork, and hams.

The Home-fed supply. — The severe drought in 1911, and the consequent scarcity of food for live stock, naturally resulted in a large number of sheep being marketed for meat that would otherwise have been included in the census of June, 1912.

The total number of sheep and lambs in June, 1911, was 30 480 000, whereas in June, 1912, the number was only 28 967 500, *i.e.* a reduction of 1 512 500. In addition to the usual supply of mutton and lamb, there was therefore that derived from over 1 500 000 sheep and lambs that were marketed because of the drought.

In June, 1911, the number of sows kept for breeding was larger than in any previous census, being 549 080, or 86 200 more than in June, 1910. These additional sows probably increased the supply of pigs in the twelve months June, 1911-12, by about 1 034 000.

The supply of home-fed fat stock, so far from being decreased by a severe drought, is usually largely increased, because stock are marketed in excess, but the cost of fattening is considerably increased, as more feeding-stuffs have to be purchased, and home-grown corn has to be fed to stock that but for scarcity of keep could be sold.

Estimated Supply of Home-fed Stock.

	Number	Estimated av. dressed weight
Fat cattle	1 975 000	45 stones of 14 lb.
Veal calves	1 271 500	90 lb.
Fat sheep	10 692 000	68 »
Fat lambs,	2 380 000	40 »
Bacon and pork pigs.	6 305 500	1 1/8 cwt.
	22 624 000	

	Number	Estimated weight of dressed meat
Cattle and calves	3 246 500	12 131 100 cwt.
Sheep and lambs	13 072 000	7 979 100 »
Pigs (for bacon and pork)	6 305 500	7 566 600 »
	22 624 000	27 676 800 cwt.

Value: £87 182 000.

Imported Meat.

	Cwt.
Imported meat	20 938 067
Meat from imported stock	326 193
	21 264 260

Value: £47 545 500

Total Supply.

	Cwt.
Home-fed meat	27 676 800
Imported	21 264 200
	48 941 000

In the home supply the estimated weights of cattle and sheep exported are included in the above figures. After deducting the quantity of meat exported, the quantity consumed was:

	Cwt.
Home-fed meat	27 326 800
Foreign and Colonial	20 928 400
	48 255 200

This equals 118 ½ lb. per head of the population (45 600 000).

In many countries population is increasing more rapidly than the herds and flocks. The high prices of fat stock now ruling are likely to be maintained for some time to come.

Well-bred herds and flocks in the hands of experienced farmers are as safe and remunerative an investment at the present time as can be found in connection with the land, and they continue to be the sheet anchor of farming.

1090 - **The Origin of the Industry and Trade of Cold-Stored Meat, especially in the Argentine Republic.** — *Annales de la Sociedad Rural Argentina,* Year XLVIII. Vol. XLVII, No. 1, pp. 52-60. Buenos Aires, January-February 1913.

The cold storage of meat, which is now recognized as one of the most important industries of the world and which supplies material for a most active trade between the various continents, is of quite recent origin, having arisen within the last thirty years.

Before entering into the causes of the development of this industry, the writer examines two interesting kindred subjects, one of which is the decrease of live stock in Great Britain during some decades previous to the introduction of cold-stored meat, and the other the canned meat industry in Australia.

It was naturally the demand for meat which caused the discovery of means of increasing the supply on the English markets. There are no official statistics available as to the numbers of cattle and pigs in the United Kingdom before the middle of the nineteenth century, the first livestock census having been taken in 1876. Nevertheless, according to Mulhall's fairly exact calculations for the decade 1851 to 1860 during which meat began to be imported into the United Kingdom, the average production of beef, mutton and pork for England, Scotland and Ireland was 900 000 tons, corresponding to 77 lbs. of meat per inhabitant. There was besides an importation of 43 300 tons of live stock which brought up the total to 81.4 lbs. per head. During the decade 1861-70 the average production rose to 1 020 000 tons and the imports to 129 000 tons. In 1882 the production was 1 073 000 and the imports rose to 643 700 tons, corresponding together to an average of 121 lbs. per inhabitant per year., of which quantity 46 lbs. was imported. The meat produced in England in 1882 consisted of 680 000 tons of beef, 300 000 tons of mutton and 93 000 tons of pork. The imports were chiefly living cattle and sheep.

The following figures of the number of animals slaughtered in Great Britain — oxen, sheep and pigs, — give an idea of the decrease in the numbers of cattle between 1867 and 1880 and of the return to the figures of 1867 by means of the importation of animals and meat between 1880 and 1910.

1851 to 1853	40 676 000	(Mulhall)
1867	46 770 524	(official figures)
1880	42 974 261	»
1910	46 491 521	»

As for the importance of the quantities of meat imported into the United Kingdom during the last fifty years, it is sufficient to note that during the five years 1861-65 the average amount of imported fresh beef, mutton and pork was only about one tenth of a pound per inhabitant, while the introduction of cold-stored meat in 1880 raised the average between 1881 and 1885 to 3.5 lbs., between 1891 and 1895 to 12.4 lbs., and between 1906 and 1910 to 28 lbs.

In Australia and in New Zealand about the year 1870 the numbers of live stock had increased very rapidly whilst the human population was still very sparse; the consequence was a fall in the prices of stock. It was between 1868 and 1879 that the trade in cold-stored meat sprang up, namely after the experiments of Harrison and Mort in Australia, and of Tellier and Carré in France, and after the fortunate voyage of the steamship "Strathleven" had removed every doubt as to the practical application of the process. But before the trade in cold-stored meat had commenced, the exportation of canned meat had already developed in Australia. The first to use glazed earthenware vessels for preserving meat was a Frenchman, Appert, and the first mention of his method was made in 1809. Before his time glass vessels were used and afterwards iron ones (Heine's English patent No. 3310 in 1810). Tin cans were introduced in 1850 by the brothers Pellier. Liebig's methods also were adopted by the meat industry in Australia.

In 1850 there were 110 factories which boiled down meat for tallow. The sheep thus treated were 800 000 and the oxen 73 000 and the product export amounted to nearly 11000 tons. In 1851 the industry increased further and it is probable that 10 per cent. of the Australian sheep were destroyed by this ruinous process. The same system was adopted in New Zealand to utilize the surplus of stock.

The United States of America were the first to start the trade in meat refrigerated during the journey. The first exportation of chilled beef from the United States began in 1870. At the end of 1880, when the first cargoes of Australian mutton arrived, Great Britain had already imported about 120 000 tons of fresh meat from North America.

Captain Nuflo Chaves introduced the first sheep into the Argentine Republic in 1550; the first cattle (seven cows and a bull) were imported by Juan de Salozer y Espinosa. The Spanish colonists settled along the Rio de la Plata and Juan Torre di Vega y Aragon, recognizing the favourable conditions of the pampas for live stock, divided among the colonists 4000 head of cattle and 4 000 sheep. The animals multiplied rapidly and soon exceeded the requirements of the scarce population, which then already began thinking about the possibility of some exportation, limiting it however to hides. In 1616 the ship "Nuestra Señora de Refugio" left Buenos Aires with a cargo of 1281 hides worth 10 248 reals (about £270). In 1794 Don Manuel José de Labarden imported from Spain into one of the provinces of Rio de la Plata 10 Merino rams and 20 ewes and in 1813 Mr. Henry Lloyd Halsey imported 100 head of this breed into the province of Buenos Aires. The first importation of English breeds was effected in 1825 with thirty Southdowns and the first importation of Lincolns took place in 1840.

In order to utilize commercially the enormous herds and flocks living almost wild in the Plata lands, factories for the salting of meat were established. The first was started in 1717 and the exportation of salted meat began. In 1822 the value of the hides, tallow and wool exported amounted to about £650 000 per annum; as for salted meat, 35 220 tons passed through the Buenos Aires Custom House in 1862 and 42 397 tons in 1866. The importance of this industry is such that the number of animals treated in the "saladeros" is more than double that of those slaughtered for cold storage.

The first importation of Shorthorn cattle was effected by Don Juan N. Fernandez in 1865. Then followed the constitution of the "Rural Argentine Association", which marks the beginning of a series of intelligent and successful efforts for the promotion of a well organized animal husbandry. About that time the importation of pure bred animals of the best breeds began to be practised on a large scale with the object of improving the local breeds.

In 1868 the Argentine Government offered a prize of about £ 1600 for a practical method of preserving fresh meat. In 1877 the Government suspended for five years the export duties on fresh meat and in 1882 abolished them finally.

The following figures taken from four official Argentine live stock census returns give an idea of the progress of stock breeding in that country.

Year	Cattle	Sheep
1875	13 337 862	57 501 261
1888	21 963 930	66 701 097
1895	21 701 526	74 379 562
1908	29 116 625	67 211 754

In 1874 the exportation of live animals began, and by the end of 1879 about 1 000 000 head of cattle and 165 000 sheep had been exported. The attempt made in 1876 by Charles Tellier with the steamship "Frigorifique" gave perhaps the first impulse to the creation of cold-storage establishments. The success of the "Strathleven" caused a greater stir and lastly the steamer "Paraguay", in 1883 with a cargo of cold-stored meat for the Old World began the great exportation of fresh meat from the Argentine. This has led to a notable increase in the prices of live stock and has been a powerful stimulus to the improvement of the local breeding.

The exportation of fresh meat from Argentina was always mainly directed to the United Kingdom.

The "Financial Times", in reviewing the report on the trade of cold-stored meat in the United Kingdom during 1912, notes an increase in the exportation from Argentina and states that the South American products amount to 64 per cent. of the meat consumed in England. It adds that probably this trade will increase still further in 1913 and that the prices will be higher than those of 1912. The figures published in England for 1912 show an importation into the United Kingdom of 1 580 648 quarters of frozen meat, with an increase of 170 492 quarters over the previous year. Into the same country 2 220 697 quarters of chilled beef were imported, with an increase of 69 531 quarters over the preceding year.

The exportation of frozen and chilled meat from the Argentine Republic during 1912 amounted to:

Frozen carcases of mutton	3 584 927
Frozen quarters of beef.	2 086 780
Chilled quarters of beef	2 269 474

On the whole the exports were higher than in 1911. There was an increase in the quantity of beef and a decrease in that of mutton. The number of animals slaughtered in the Argentine "frigorificos" during 1912 was 1 417 213, and that of those worked up in the "saladeros" in the same time was 116 900, thus distributed: Rios, Argentina and Uruguay 36 300; Montevideo, 47 000; Frontera, 19 600; Rio Grande, 14 000. The exportation of live cattle in 1912 was 261 416 head, or 77 304 more than in 1911.

The export of "tasajo" (jerked beef) in 1912 was about 8 600 tons. The exports of frozen and chilled beef during the month of January 1913 exceeded those of the corresponding month of 1912, while the amount of mutton exported was much less.

The numbers of animals slaughtered at the "frigorificos" during the month of January 1913 were as follows:

Compañia Sansinena de carnes congeladas	30 360
The River Plate Fresh Meat Co	13 573
Las Palmas Produce Co.	12 407
La Blanca	19 859
The La Plata Cold Storage Co.	28 075
The Smithfield and Argentine Meat Co.	7 444
Frigorifico Argentino	8 627
La Prigorifica Uruguaya	4 472
Frigorifico Montevideo	5 263
	130 080

WINE-MAKING

1091 - **Good Wine and Bad Cellars.** — MATHIEU, L. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1022, pp. 74-80. Paris, July 17, 1913.

After having reviewed the causes of the bad conservation of fine wines in the modern cellars of large towns subject to high temperatures and tremors, causes which act by favouring the multiplication of bacteria, the writer points out the real remedy for this state of things: To ensure the conservation of wines it is sufficient to prevent their being the seat of bacterial diseases.

This result may be obtained in various ways:

1. By bottling them free from bacteria, either by a sterilizing filtration or by a perfect clarification; but the contamination of the inside of the glass, of the corks, and even of the air in contact with the wine during the operation of bottling, must be guarded against.

2. By rendering the wine unfit for the multiplication of bacteria by such a high alcohol content as to be antiseptic; this is the case with liqueur wines which are brought up to at least 17 or 18 per cent. of alcohol,

but this process is not practical for wines for ordinary consumption nor for those of great vintages.

3. Wines may also be kept at temperatures lower than those favourable to the vitality of germs, for instance below 10° C., but this is a solution which can only be adopted by people who have such cool cellars.

4. Lastly the bacteria which are in the wine may be killed, so that one becomes independent of exterior conditions and of the constitution of the wine. In this manner any wine whatever, as well as milk, broth and the most perishable food stuffs may be kept by destroying the bacteria and preventing new invasions taking place by contact with the air. As wine is kept in well closed bottles, it is enough to warm the corked bottles to a temperature of 65° or 70° C. in a water bath in order to sterilize at the same time the wine, glass, cork and air, if there is any in the neck of the bottle; in this way an indefinite preservation is ensured.

The experience of about half a century has recognized the value of pasteurization; experiments carried out at Bordeaux by M. Gayon have established with precision the conditions of temperature to be reached; numerous tests conducted at the Beaune Station have proved that the finest wines may be pasteurized without hesitation provided the operation be carried out with due caution.

This operation is very easy; and it does not require much or costly plant. It has been objected by some that the process gives a taste as of cooked wine and that it causes a certain amount of breakage. No doubt some such accidents do take place with inexperienced hands, but now-a-days it is very easy to pasteurize bottles even on an industrial scale.

The bottles are filled with wine and then well corked. They are then kept for a month on their sides, after which they are heated in a water bath, taking care not to plunge them into warm water if they are cold or viceversa. The temperature of the water should not be above 40 or 45° C. according to the initial temperature of the bottles. The corks must be fixed by a clip, by some string or wire, because during the process of warming, the wine expands and the pressure would cause the corks to fly out.

As soon as a thermometer placed in a bottle of the same shape and capacity as the bottles containing the wine, but filled with water, shows a temperature of 65 or 70° C., the bottles are to be removed from the bath. They are allowed to cool in the open, standing and not on their sides, or still better they are cooled in a tub by a current of water, taking care at first to mix cold water with the warm water poured into the tub before placing the warm bottles into it. Care must be taken also that the necks of the bottles be well out of the water; otherwise the contraction of the wine on cooling would cause water to enter through the fissures of the corks.

A temperature of 65 to 70° is sufficient to lower the vitality of all the germs likely to develop in wine and consequently it is sufficient to ensure the indefinite conservation of the wine under any conditions. The wine may be sent any distance in the holds of ships, under tropical climates; it may be sent to the colonies and kept there, it may be carried on pack animals during the hottest days without any risk of deteriorating. That is to say it may be kept equally well in any cellar with heating apparatus and gas or in the neighbourhood of the greatest traffic without suffering in any way ; it will only grow old more rapidly.

1092 – **The influence of Some Elliptical Yeasts on the Constitution of Wine and other Fermented Liquids.** — VENTRE, JULES in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, New Series, Vol. XIII, Part I, pp. 19-67. Montpellier, July 1913.

This paper is a study of the influence of certain ellipsoidal yeasts on various natural media, such as the juice of black and white grapes of different concentrations of sweetness. The writer has made use of the four most important yeasts of the southern disticts, namely :

For red wines: 1) the yeast of Beaujolais from the vineyards of Moulin à Vent , 2) the yeast of Burgundy from the vineyards of Romanée-Conti, 3) the yeast of Médoc from the vineyards of Margaux.

For white wines : the yeast of Verzenay (Champagne) from Chandon.

According to the writer's preliminary experiments, these types may be considered quite fixed.

In the products of fermentation he has determined all the elements that can be separated by reliable methods : Alcohol, fixed and volatile acidity , dry extract and its principal constituents (glycerine, succinic acid etc.) He gives an account of the methods of analysis adopted. In determining the influence of the ferments on the acidity he has made researches on the constitution of the fixed acidity. By taking all these partial results together the writer was able to deduce conclusions showing at what stage the yeast was able to influence the medium in which it grew and give it a special character varying with the different species studied.

These conclusions are of theoretical and practical importance.

From the theoretical point of view they may be summarised as follows:

1. In any particular medium, yeasts do not all act in the same way, as regards either taste or chemical composition.

2. Some of them show a power of attenuating comparable to that of certain brewer's yeasts. This attenuation particularly that occuring on the yeasts of Verzenay, is concerned chiefly with the glycerine and succinic acid.

3. The Médoc yeasts always produce a larger dry extract than is found in the other media, but without any reducible matter being left unutilized.

4. Certain yeasts, those of Médoc in particular, have a special tendency to produce volatile acids.

5. The production by certain yeasts of volatile acids in considerable quantity is not connected with the presence in the liquid of pathogenic germs, such as that causing "tourne," which consume a portion of the sugar to produce volatile acids, thus reducing the alcohol content. It is therefore necessary to assume the presence of a distinct biochemical factor.

6. The fixed acids are attacked in different ways and to different degrees by various yeasts. Even tartaric acid, which is usually considered to be resistant to such decomposition, was changed by these organisms. Malic acid, however appears to be the most easily attacked and in a

specific manner by each yeast. The yeast of Verzenay and Médoc are less active with this acid than the others. This accounts for the fact that the products from musts treated with Verzenay yeast have a more acid taste than those treated with the Beaujolais organism. When tested chemically, these products do not show any difference in their total acidity.

7. The quantity of ether produced in a wine appears also to indicate a separate biological process. In fact there is not always absolute correspondence between the quantity of volatile acid determined and the quantity of ethers formed. The Verzenay product shows also greater proportion of ether than that of the other products.

From the point of view of the analysis of the wines, very interesting conclusions can be drawn.

A natural wine treated with the Verzenay organisms and allowed to ferment a short time would be spoilt and attributed to adulteration by the addition of alcohol for the relation between the weight of alcohol and extract would be too great. In fact though the experiments on red wines made by the writer cannot be considered as typical of the entire vintage, they give results very similar to those of the rose-coloured wines. In this case if the ratio alcohol to extract is taken as 4.6, it is found that in the experiments of 1911 all the wines would be considered as having had 5 to 27 per cent. of alcohol added to them.

From the practical point of view. A knowledge of the peculiarities of each specific yeast opens up a new field for the application of yeasts in wine making. Considering only the differences in the organoleptic characters given to the same media by the yeasts of Verzenay and Beaujolais, there is no doubt that in warm countries where a low acidity is the general rule, it would be valuable to use a yeast, say that of Champagne, which would preserve the maximum of the products. In cold countries, where the acidity is great, it would be necessary to add a yeast which decreases the acidity.

The writer proposes to carry on researches with a view to determining the exact condition for using these yeasts in wine-making.

BREWING AND DISTILLING

1093 - **Alcohol from the Fruit of the Strawberry Tree (*Arbutus Unedo*).** - SANI, GIOVANNI in *Atti della Reale Accademia dei Lincei, Rendiconti,* Vol. XXII, Part 12, 1st Half-year, pp. 884-885, Rome, June 15, 1913.

According to the writer there are few forest trees that could give as high and constant returns as the strawberry tree if it were systematically cultivated and utilized. The analysis of its ripe fruit shows an average sugar content between the years 1905 and 1913 of 18.83 per cent. The experiments here mentioned were carried out in the laboratory of agricultural chemistry at the R. Istituto Superiore of Perugia. On December 5, 1905, 330 lbs. of fruit were crushed in a vat. Fermentation set in on January 7 and ended on the 22nd of the same month. *Saccharomyces ellipsoideus* was the prevailing ferment, but there was also some *S. apiculatus.* The liquid expressed from the mass contained 10.5 per cent. of alchool. On distillation it yielded an alcohol possessing a delicate taste and the perfume of the fruit and which improved with age.

In successive experiments many hundredweights of fruit were fermented, the resulting wines containing from 9.15 to 9.75 per cent. of alcohol. The results of the analysis of one of the wines obtained by pressing the fermented mass are given in the following table. By partial rectification the writer obtained alcohol at 85°, which on being analysed gave the results given in the following table. According to the writer the preparation of this alcohol on a large scale could be carried ont in favourable conditions.

Wine made from strawberry tree fruit.

Specific gravity	1.030	
Alcohol	9.15	per cent.
Total acidity	14.1	per thousand
Bitartrate	3.96	»
Tartaric acid	0.06	»
Volatile acidity	0.55	»
Tannin	0.781	»
Dry extract	102.20	»

Alcohol from strawberry tree fruit.

Acidity (as acetic acid)	gm. 0.132 gm. per litre
Ethers (as ethylacetic ether)	» 1.757 » » »
Furfurol (with acetate of anilin and floroglucin)	present but not determinable by weight.
Methylic alcohol (Denigès method)	present
Free hydrocyanic acid	nil.
Combined hydrocyanic acid	»
Fusel oil (Röse's method, increase of volume, difference from pure alcohol 0.35 gm.)	gm. 2.321 gm. per litre calculated by Sell's tables.

VARIOUS

1094 - **The Present State of the Industry of Esiccating Forage.** — MEYER, D. in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 61, pp. 555-557. Berlin, July 30, 1913.

Drying of Potatoes. — The methods adopted in practice for drying potatoes use hot gases, steam or hot oil. The first are especially employed for drying sliced potatoes and the others for potato flakes. For drying by means of hot gases, the esiccators used are those on the drum, trough, and sometimes on the hurdle system, whilst for steam or oil drying only roller esiccators are used (1).

The cost of drying by these various methods varies according to the size of the plant and the duration of the work. The longer this is, the lower the total expense per cwt. of potatoes. In the second place the cost is determined by the output of the plant, which in its turn depends chiefly upon the consumption of coal. For this reason and especially in the manufacture of flakes, motor engines that work well and at the same time supply the steam to be used in the drier must be used. In drying by means of the conbustion gases a good utilisation of their heat must be attained. Besides, the cost of drying potatoes varies according to the starch content of the same potatoes and the water content of the dried potatoes. The greater the starch content of the potatoes, the less moisture is there to evaporate and the greater the quantity of dried potatoes turned out in a given time. With a good plant the average cost of drying is 4.18 *d* to 4.78 *d* per cwt. of raw potatoes if the gases of combustion are used, and 5.38 *d* to 5.97 *d* per cwt. with steam.

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(1) For a detailed description of the various methods of esiccating, see the writer's work *Handbuch der Futtermittel-und Getreidetrockmung*. Leipzig 1912, (Jäneke).

The utilization of raw potatoes by means of esiccation depends on the starch content of the tubers, the cost of drying, and the price of the dried potatoes when they are not consumed on the farm itself but get sent to the market.

As dried potatoes are often used instead of foods rich in carbohydrates such as maize, barley and the like, their price must be considered in connection with that of these foods on the market. In the feeding of horses, their price must be compared to that of oats. At a price of 7*s* 5.65*d* per cwt. of dried potatoes and a cost of 4.78*d* for drying, the writer considers that one hudredweight of fresh potatoes containing 16 per cent. of starch gets paid 1*s* 4.85*d*; if they contain 18 per cent. it gets paid 1*s* 7.48*d* and 1*s* 9.8*d* when they contain 20 per cent. At a price of 8*s* 5.6*d* per cwt, the prices are respectively 1*s* 7.84*d*, 1*s* 10.71*d* and 2*s* 1.22*d*.

In selecting the method of drying to be adopted, the economical conditions and the uses to which the product is destined must be considered. The writer advises plant for the production of flakes, if potatoes are the only crop to be worked up and if they are to be used chiefly for feeding to pigs, also if the plant is connected with a distillery or starch works or dairy and if the quantity of potatoes is not very considerable. If on the other hand besides potatoes, beet leaves, other forage or cereals have to be esiccated, and if the product is to be fed to horses, cattle and sheep it will be preferable to select a plant for the production of dried slices. As for the dimensions of the apparatus, it must be remembered that a large plant is not profitable unless the time during which it is worked is fairly long, namely from 150 to 180 days. In the case of cooperative drying plant the first thing to be done is to make sure of a sufficient quantity of potatoes to be dried. The writer considers that the high cost of cooperative drying is due to the fact that the time during which the plant works is too short.

When the quantity of potatoes to be dried is not enough to keep an independent plant going, recourse may be had to one attached to a distillery, dairy, etc. Before deciding, it is necessary to consider carefully all conditions.

The writer is of opinion that potatoes which are to be fed shortly after the harvest to cattle, sheep and pigs should not be dried. On the contrary, those destined for horses should always be dried. Potatoes stored up to the end of the winter suffer a loss of substance amounting to 8 and even 10 per cent, and if they are not fed to the live stock until the spring or summer the loss reaches as much as 25 per cent. Supposing the prices of potatoes to be 1*s* 6*d* or 2*s* per cwt. the loss would be 4 ½ *d* or 6 *d* per cwt. The loss caused by storing is about the same as the cost of drying. When the prices of potatoes are low the cost of drying is not less than that of ensilaging, but drying affords the possibility of utilizing completely all the nutritive matter, and in years of abundant crops it saves the farmer from having to throw on the market large quantities of potatoes at a low price or to feed them wastefully to his stock.

Esiccation of Beet leaves. — Among the secondary products and residues of the cultivation of beets, the leaves present the greatest interest as to esiccation and this because their ensilage and their subsequent feeding to live stock present several drawbacks, amongst which particularly the loss of nutritive matter. This method of using them entails a considerable loss of money, as may be seen from the following figures: From 1906 to 1910 in Germany the acreage devoted every year to beets averaged 1 113 700 acres. Admitting the amount of leaves produced per acre to be 10 tons, the total crop would be 11 137 000 tons. If it be considered that two-thirds of this amount is ensilaged and that during this process one-third of the dry matter is lost, the loss amounts in round numbers to about 2.5 million tons of fresh leaves, or calculating that 5 tons of fresh leaves produce 1 ton of dried leaves, the loss amounts to about half a million tons of dried leaves, worth about £1 200 000.

The esiccation of beet leaves is carried out chiefly in drum esiccators and sometimes also in hurdle esiccators. The various models of the former differ considerably from each other in the construction of the interior and the gradual passage through the drum of the stuff to be dried. The progress achieved during the last ten years in this field becomes evident if the composition and aspect of the product be considered. Formerly the dried leaves were hard and brittle, while now according to recent methods the dried leaves have preserved their original green colour, they are soft, elastic, cleaner and possess a starch va'ue of 35 to 38 per cent, instead of 25 to 28 as formerly.

The cost of drying varies, as it does with potatoes, according to the size of the plant and the duration of the work, which, considering the great losses which would be caused by rotting, cannot be extended at will, but averages 70 to 80 days. On account of the shorter working period, the interest and amortization of beet leaf drying plant is fairly high. Whilst in potato drying about 2.39 to 3.59 *d* per cwt. are to be debited as general expenses, in beet leaf drying 5.96 *d* have to be debited. The writer believes that a notable diminution of general expenses is possible when the plant can be used also for other foodstuffs. Further the cost of drying is influenced also by the efficiency of the plant and by the amount of fuel consumed. If coal is used about 6.56 *d* to 7.15 *d* is required per cwt. of dried leaves. Using lignite the cost of fuel is less. Again the cost of drying varies with the amount paid for labour and the use of teams, which may be set down at 4.48 to 5.96 *d* per cwt., and with the moisture content of the fresh and dried leaves. If the leaves are dried immediately after the harvest, the writer states that for the production of 100 lbs. of dry leaves containing 12 to 15 per cent of water, from 550 to 600 lbs. of fresh leaves are required. If on the contrary the leaves are left for a certain length of time in the field only 350 to 500 lbs., or an average of 450 lbs., are required to produce 100 lbs. of dried leaves. The question as to how far this partial drying of the leaves may be carried without incurring too heavy a loss depends naturally upon the weather.

The cost of drying in an installation devoted exclusively to beet leaf drying ranges from 1*s* 5*d* to 1*s* 7*d* per cwt. of dried leaves. If other forage is dried also the cost diminishes.

As for the profitablemess of drying beet leaves, the writer considers first class beet leaves to possess about the same value as the best meadow hay. If the economic value of the latter be taken at 2*s* 6*d* per cwt., the value of the leaves, after deducting 1*s* 6*d* for the cost of drying, is 1*s*.

Assuming 450 lbs. of leaves partially dried in the field to be necessary to produce 100 lbs. of dried leaves, the cwt. of the former would be worth 2.63 *d*, which must be considered as a favourable price. In view of this, and of the disadvantages attendant upon an excessive use of silage, an extension of the practice of drying beet leaves is justified, especially in breeding farms in which ensilage is often injurious. In milk farms on the contrary, where milk and dairy produce command only medium prices, the use of dried leaves is, according to the writer, of limited advantage because the successful production of milk depends only very partially upon the feeding of concentrated foods. Nevertheless here also esiccation allows of a better utilization of the beet leaves.

Drying of sugar-beet and mangold slices. — In this field the technique of esiccation has not achieved any considerable progress recently. The number of sugar factories which have erected drying installations has undoubtedly increased of late, which speaks for the recognition of the importance of the drying of the slices.

The market price of mangold slices was, during recent years, higher than their economic value, which was 3*s* 9*d* to 4*s* per cwt. The price of sugarbeet slices stood also higher than their nutritive value.

In conclusion the writer speaks of the drying of yeast, a subject which has already been treated in detail in thus Bulletin (1).

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(1) See *B.* May 1913, p. 692: "The Development of the Dried Yeast Industry in Germany", by Dr. F. Hayduck.

PLANT DISEASES

GENERAL INFORMATION.

GISLATIVE D ADMINI-TRATIVE EASURES

1095 – Proclamation Regarding the Importation of Potatoes into Western Australia. — Extract from the *Government Gazette* of November 22, 1912.

The Governor revokes the Proclamation published on April 19, 1912, and makes the following regulations:

The introduction into Western Australia of any potatoes the product of, or directly or indirectly from, the State of Queensland is prohibited absolutely.

The same prohibition extends to potatoes coming directly or indirectly from the States of New South Wales, Victoria, South Australia and Tasmania, except in accordance with regulations made by Order in Council under the "Insect Pests Amendment Act, 1898".

The ports Eucla, Esperance, Hopetoun, Fremantle, Perth and Geraldton and all ports north of Geraldton are to be the only ports of entry for potatoes and potato bags.

It is absolutely prohibited to bring potatoes, or second-hand potato bags, from any other portion of Western Australia into all that part of Western Australia which is bounded by a line commencing at the sea-coast at Rockingham, and extending along the north boundary of Rockingham and thence extending in a straight line to the south-west point of Mundijong townsite, and thence in a straight line eastward to the most southerly point of Beverley townsite, and thence eastward to the 119th degree of East longitude, and thence south along the said meridian to the sea-coast, and thence following the sea-cost westward and northward to the starting point.

With the consent in writing of the Minister for Agriculture, seed potatoes, the property of the Department of Agriculture may be brought into the area described.

The introduction is prohibited into Western Australia, from the States of New South Wales, Victoria, South Australia, Queensland, and Tasmania, of second-hand bags that have been used for the carriage of potatoes, either empty or containing goods. Empty bags may, however, be introduced at the port of Fremantle, if disinfected according to regulations made under the Act of 1898.

This Proclamation shall have operation and effect on and from the date of its publication in the *Government Gazette* of November 22, 1912.

1096 - **The Obligatory Destruction of the Stinking Mayweed *(Anthemis Cotula)* in the District of St. Leonards, Tasmania.** — BLACK, R. A., Federal Quarantine Officer (Plants, etc.). — *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, pp. 165-169 + 1 plate. Hobart, May 1913.

At the request of the Municipal council of St. Leonards, the stinking mayweed (*Anthemis cotula* L.) was proclaimed on the 27th of March 1913 a noxious weed for its municipality, under section 6 of "the local Government Act 1906" (6 Ed. VII, No. 31) It has also been proclaimed for several shires in Victoria and New South Wales.

This weed grows in profusion on roads where either side is grassed. From experiments carried out in America, its seed has been found to be viable after 25 years. It was imported into Tasmania mixed with farm seeds and is a prohibited weed under "The Federal Quarantine Act, 1908", which means that the importation of the plant or its seed from any part of the world into Australia is forbidden under a severe penalty. It is now incumbent upon the Municipal Council of St. Leonards to take action for the eradication of this weed. Every occupier of land who does not destroy the stinking mayweed on his property is liable to a penalty not exceeding £ 20. Any person who knowingly sells hay, straw, or grass seed or any kind of grain containing seeds of *Anthemis cotula* L. is, liable to a penalty of not less than forty shillings nor more than twenty five pounds.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1097 - **Floral Abnormalities in Maize, which appeared spontaneously in France in 1912.** - MIÈGE in *Bulletin des séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No. 4, pp. 292-295, 3 figs. Paris, April 1913.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

Abnormalities in the flowers of maize have been so numerous in some districts of France as to have assumed the proportions of a calamity.

In some cases, female spikelets have been substituted for the male spikelets of the base or the summit of the ramified panicle; in others the lateral stems have been transformed into mal-formed bunches; while complete metamorphosis has resulted in a single terminal ear of irregular shape with indented seeds separated by the glumes of persistant female flowers. This metamorphosis has often been associated with abundant tillering, insufficient ripening, as well as reduction or abortion of the seed.

In spite of the removal of abnormal stems during hoeing, those remaining at harvest formed two-thirds of the crop.

The disease seems to occur independently of any traumatism; and appears due to a disturbance of the physiological equilibrium, in the form of an excess of nutrition due to a large amount of nitrogen, and especially to abundant rainfall. The correctness of this hypothesis seems to be proved by a similar observation made by the writer. On soil which had been continuously cultivated for 12 years without being manured, the maize crop showed every year the opposite modification to that just mentioned, *viz* the female flovers were converted into male flowers. This kind of sexual retrogression appears to be the result of a deficiency in the food supply. The regulation of the latter is the best means of diminishing the frequency of these abnormalities.

1098 – **Studies on the Water Core of Apples.** — O' GARA, P. J. in *Phytopathology*, Vol. 3, No. 2, pp. 121-128 + 2 figs. Baltimore, 1913.

Water core is a disease which occurs more or less generally in all the districts of the United States, particularly in the arid and semi-arid parts. It has also been recorded in Europe, Asia and Africa.

The writer has done considerable work on this disease during the past few years. Some European writers have held that water core is caused by bacteria, although others have shown that the trouble is not due to any parasitic agency. All the methods known to modern bacteriology, especially those used in the study of ultra-microscopic organisms, have failed to show the presence of any organism. The inoculation experiments of the writer afforded no positive results.

The affected apples have hard watery areas extending outwards from the outer edges of the seed cavities. In the beginning stages, the first appearance of water core is in connection with the vascular system. Later the seed cavity usually contains liquid and the hard inner membrane of the carpels is cracked and covered with hair-like growths, the fruit has a somewhat sweetish fermented flavour, and the watery parts contain more sugar and less acid than the normal or unaffected parts. It is during the later stages of the disease that fungi and bacteria are present. *Alternaria* sp. is a common intruder and produces a serious core rot. The *Alternaria* infection may be prevented by the application of Bordeaux mixture.

The most prominent factors inducing water core are: 1) excessive or strong vegetative growth, especially in young trees just coming into bearing; 2) high cultivation and the consequent retention of moisture in the soil; 3) excessive precipitation or irrigation shortly before the maturity of the fruit, if followed by great differences in the day and night temperature and atmospheric humidity (the fruits most affected are those farthest out on the terminals and those on the south or south-west sides of trees); 4) severe pruning shortly before the ripening period, or defoliation by disease or otherwise; 5) frosts; 6) rapid conversion of starch into sugar.

In a heavily irrigated orchard, 90 per cent. of the fruit became water-cored, and in one which was severely pruned during the latter part of August nearly all the crop was similarly affected, while in neighbouring orchards, growing under the same conditions as regards the soil and the variety cultivated, 5 per cent. and none of the fruit was respectively attacked.

In order to prove that it is universally true that water core is more liable to occur in exposed fruits, the writer had a large number of apples picked from the south and south-west parts of trees, and others taken from unexposed positions. In the former case, 90 per cent. of the fruit showed water core, while less than 5 per cent. were water-cored in the latter.

case. The degree of alteration is in proportion to the exposure of the fruit, to extremes of temperature and humidity. Usually, water-cored apples have a much higher colour than those not affected.

Under proper storage conditions, water-cored fruit, unless badly diseased, will entirely recover. This will be the case where no liquid fills the seed cavities, and if the fruit is placed in a cool even-temperatured place (not cold storage). This shows the non-parasitic nature of the trouble. Thus, as soon as it is found that apples are beconning water-cored, they should be immediately picked and placed in proper storage.

In an experiment, 1000 boxes of Newtown apples, of which fully 90 per cent. were water-cored, were stored for about three weeks. At the end of this time, the fruit was again examined, and scarcely 1 per cent. were still affected. The only cases not fully recovering were those in which the seed cavities had become filled with liquid.

BACTERIAL AND FUNGOID DISEASES.

1099 – **Pure Cultures of *Phytophthora infestans* De Bary, and the Development of Oospores.** — PETHYBRIDGE, GEORGE H. and MURPHY, PAUL A. in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XIII (N. S), No. 36, pp. 566-588 + plantes XLV-XLVI. Dublin, 1913.

FUNGI

In the case of *Phytophthora infestans*, the parasitic fungus which causes the potato blight, the study of the life-history of the parasite has failed to reveal with any certainty any stage in which sexual organs are produced, although many of its allies amongst the Peronosporaceae have been shown to produce such organs.

The writers consider that, in studying the life-history of a parasite, it is not sufficient to obtain the details from the latter as it grows upon its host, but the fungus should be grown as a saprophyte on a suitable artificial medium as it is possible that, under these conditions the organism may show stages in its cycle of development which are not produced during its career as a parasite.

An account is given of previous experiments undertaken for the purpose of obtaining suitable substrata for *Phytophthora infestans*, and a detailed description of the pure cultures and the technique employed in the several cases follows.

In some pure cultures, *P. infestans* did not form sexual organs, in others it formed sexually produced spores, or oospores; thus the work of Clinton was confirmed. Whether, however, these spores are *strictly speaking* formed sexually or not — that is whether an actual process of fertilization occurs or not — cannot be decided at present. Clinton (1911) found that in the absence of antheridia, the oogonia did not do more than develop oospheres, but Messrs. Pethybridge and Murphy observed that in at least one-third of the cases examined under such circumstances, both in Clinton's medium and their own, oospores were produced; they looked upon such spores as having been formed parthenogenetically. These spores resemble those formed when antheridia are present, except that in many cases their walls appear to be slightly less thickened.

Even when antheridia are present, it is difficult to see how the oosphere can be fertilized, for it is completely shut off from the antheridium by the funnel-shaped base of the oogonium and no signs of a fertilization track have been observed. It is of course possible that a union of the male and female elements may occur soon after the entrance of the oogonial incept into the interior of the antheridium, but if fertilization occurs at this stage, it occurs *before* the formation of the oosphere, which would represent an unusual state of affairs.

Clinton was not able to trace the points of origin of the oogonia and the antheridia, but states that they seem to arise on separate hyphae. The observations of the writers show that this is actually the case, and moreover they explain Clinton's difficulty in finding antheridia except such as were in contact with oogonia which were already well on in their development. Clinton states that the antheridia observed by him often show the *superimposed* "oogonial thread", but the writers find that this structure, which is in reality the lower part of the oogonium itself, is actually within the antheridium and not superimposed upon it.

Whether the fungus produces oospores in the potato plant or not, will have to be settled by further research. The writers (like, the other investigators) have found thick-walled spores in the tissues of various parts of the potato plant which have been destroyed by *P. infestans*; these may possibly have been such bodies, although as a rule they appear to be smaller than the spores obtained in pure cultures. Many of them too have been seen to be surroundend by a kind of halo of brownish material which may possibly be the remains of the oogonium wall. If such bodies are produced in the potato-plant, they would doubtless find their way to the soil and probably play an important part in keeping the fungus alive over the winter, and in causing infection of the potato crop during the following season.

RESISTANT PLANTS

1100 – **Factors affecting Susceptibility to Disease in Plants.** — SPINK, G. T. in *The Journal of Agricultural Science*, Vol. V, Part 3, pp. 231-247, plate VII. Cambridge, June 30, 1913.

From experiments on the effect of mineral starvation on species of *Bromus*, Marshall Ward concluded that decreased susceptibility to rust was only caused by the lack of sufficient food in the host plant on which the rust fungus could feed.

In order to study the question more closely, the writer made some experiments under different conditions of nutrition:

a) With wheat plants grown in nutritive solutions and attacked by mildew (*Erysiphe graminis*).

b) With the same wheat grown in boxes of soil.

c) With cultures in nutritive solutions, using wheat plants of two varieties with different powers of resistance, and both inoculated with the uredospores of yellow rust (*Puccinia glumarum*).

d) With pot cultures of the same wheats.

e) With pot cultures of wheat attacked by *Erysiphe graminis* carried out on the farm of the Royal Agricultural Experiment Station at Woburn.

f) With experiment plots of wheat and barley at the same Station. The cereals were attacked by mildew and by *Puccinia graminis*.

The conclusions which can at present be drawn from these investigations may be shortly summarised as follows:

I. Susceptibility to mildew and yellow rust in wheat, and to mildew in barley, is increased by providing the plants with large amounts of available nitrogen; ammonium sulphate and sodium nitrate seem to be equally effective in this direction.

II. Mineral manures especially potash salts, on the contrary decrease the susceptibility to disease, but cannot counteract the effect of large quantities of nitrogenous manures.

III. Plants which are semi-starved as regards nitrogen exhibit a considerable degree of immunity, even if the phosphates and potash are also present only in small quantities.

IV. Lithium salts are also effective in producing immunity, while nitrates of lead and zinc, particularly the latter, render plants extremely susceptible. Other salts of lead and zinc have very little effect on the susceptibility of plants.

V. A variety of wheat which is almost immune to a disease (such as Little Joss to yellow rust) tends to retain its immunity even when supplied with excess of nitrogenous food-material.

VI. Increased immunity does not appear to be due to a lack of food material available for the fungus in the host, as suggested by Marshall Ward, because the plants rendered relatively immune by adding phosphates or potash to their food-supply were as healthy and well-grown as those receiving no such additions.

It yet remains to be seen what physiological explanation can be found to account for the changes in susceptibility to certain diseases which can be produced in some cultivated plants by the use of certain fertilizers, and by certain chemical substances used as fertilizers.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1101 - **A Preliminary Note on a Bacterial Disease of Fruit Blossom and Foliage.** — BARKER, B. T. P. in *The Gardener's Chronicle*, Vol. LIII, No. 1375, p. 287. London, May 1913.

Early in April 1913, many blossom trusses of pears showed signs of the discoloration and blackening which is commonly attributed to frost or cold winds. The weather at that time was not, however, severe enough to have caused the damage, further, the extent of the trouble varied considerably, both on similarly situated bushes of the same variety and on adjoining branches of the same bush, while the styles and stigmas of many flowers were completely discoloured when the flower was still an unopened bud and showed no external sign of damage.

On microscopical examination of the injured flowers, large numbers of small rod-like bacteria were found in the discoloured areas. That the disease could be produced by inoculation was proved by experiments.

It seems certain that a very large percentage of the damage hitherto regarded as due to low temperature effects must be attribted to the action of the above-mentioned bacillus, which must be widely distributed in England, judging from the large number of trusses of affected pear blossom sent to the writer. It appears that this is the first record of the occurrence of this organism as the cause of pear blossom disease. Its cultural characters and the nature of the disease produced by this parasite prove it to be quite distinct from *Bacillus amylovorus* De Toni, described by Whetzel and others as the cause of " fire blight " of pears. The leaves and all parts of the flower are attacked by the organism. Whether or not it attacks the shoots and branches of the tree is at present uncertain. In the case of the variety Catillac, many developing buds have been found seriously injured.

The disease may possess considerable importance in connection with investigations on self-sterility and other fertilisation problems of varieties of different fruits.

1102 - **Cryptogamic Diseases Observed at Barbados, West Indies, in 1911-1912.**
See below No. 1113.

1103 - ***Ophiobolus herpotrichus* and Straw Blight of Wheat.** — VOGES, ERNST in *Zeitschrift für Gärungs-Physiologie*, Vol. III, Part 1, pp. 43-83, figs. 1-5. Berlin, 1913.

The supposed agent of wheat straw-blight, *Ophiobolus herpotrichus* Fries, appears from the month of June upon the stalk, leaves and shoots at the base of the whitened stem of the dead wheat plant. It occurs in the form of a stroma covering the nutritive substratum like felt. In a damp chamber, the hyphae of this stroma, when lately formed, produce conidiophores of *Fusarium rubiginosum* App. and Wollw.

On artificial nutritive media, the ascospores of the fungus germinate in a quite irregular manner. Some of them, after producing bodies resembling spores, take the form of a durable mycelium. This fungus possesses two kinds of mycelium: one durable and thick-walled, brownish yellow and thorn-like, the other finely filamentous, delicate, and light-coloured. The first corresponds to the mycelial covering of the lower internode of the stalk, and is characteristic of wheat straw-blight; the second kind of mycelium bears as reproductive bodies the conidia of *Fusarium*.

If the mycelium of *Ophiobolus* grown on a culture medium is transported on to young wheat plants which have been well boiled, a luxuriant growth of *Fusarium* results, and the brown mycelial covering appears on the stalks just as it does in the open in the case of wheat attacked by strawblight.

The *Fusarium* resulting from the culture of the ascospores of *Ophiobolus herpotrichus* is *F. rubiginosum* the so-called " Schneeschimmel ". The fructiferous form of *O. herpotrichus* is very probably *F. rubiginosum* and not, as has hitherto been supposed, *Hendersonia herpotricha* Sacc.

According to the writer, the yellowish-green mycelial covering, which appears on the lower internode of the stalks of wheat plants that have died prematurely and bear white empty ears, is not characteristic of straw-blight, since alongside of these plants with white stalks covered with mycelium, almost as many are found which have turned yellow prematurely and have died, though free from any coating of the mycelium in question. Thus *O. herpotrichus* cannot be regarded as the specific agent of straw-blight. The disease may arise from different causes; it occurs especially as a result of injury due to frost. *O. herpotrichus* is not a definite enough parasite to be able to penetrate directly into the healthy tissues of the wheat plants, and it is only when these are weakened by other causes, by meteorological agents and the attacks of nematodes in particular, that the fungus succeeds in affecting an entrance. The appearance of the mycelial covering is a secondary phenomenon and is chiefly formed by the durable mycelium which becomes entangled and intergrown with the filaments of *cladosporium herbarum* Link. and *Mucor racemosus* Fresen. According to the writer, the conidial form *F. rubiginosum,* which successfully attacks plants that have been already weakened, is more to be feared than *O. herpotrichus.*

1104 - **A Dry Rot of Sweet Potatoes Caused by *Diaporthe Batatis.*** — HARTER, L. L. and FIELD, ETHEL C. — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 281, pp. 37 + figs. + 4 plates. Washington, May 1, 1913.

This disease was observed for the first time in 1890 in New Jersey and was attributed to an undescribed species of *Phoma* to which the name *Phoma batatae* was subsequently assigned. As the rot occurred only occasionally, it was not considered of much importance and during the 22 years which have elapsed since its discovery it has not been made the subject of further study. According to the writers, the damage occasioned by this disease is greater than is supposed, as its ravages are often attributed to other causes, such as stem-rot, black rot, or even drying up owing to lack of moisture. Of late years, this disease has been recorded from New Jersey, Virginia, Mississippi, Texas, Alabama, Indiana and North Carolina.

The writers describe the course of "dry rot" in the hotbed (a yellowing of the stem preceding the formation of pycnidia), in the field, where the pycnidia do not form until the plants are in a weak or dying condition, and in the store-house where the first symptoms appear from four to six months after digging. The stored tubers show the characteristic dried, shrivelled appearance starting at the stem end and gradually extending through the tissue. Later they become hard and mummified.

The bulletin contains an account of the different stages of the life-history of the fungus and gives the synonymy of the organism. The parasitism of the latter was proved by inoculation experiments, and its behaviour on different culture media was ascertained, as well as the influence of light on the growth and formation of its fruiting bodies.

The writers sum up the results of their investigations as follows:

The ascogenous form of the organism causing dry-rot of sweet potatoes is a *Diaporthe* and has been given the species name *batatis* by the writers. The pycnidial stage was first described by Ellis and Halsted as *Phoma batatae* but the inperfect stage has been considered in the present work as belonging to the form genus *Phomopsis.* The disease is chiefly a storage trouble. It is characterised by a drying and shrivelling of the potato, on the surface of which appear many small pustules — the pycnidia lying close together and eventually covering the whole surface. The disease occurs also in the hotbed and in the field. The organism is not a vigorous parasite, and consequently under ordinary conditions does not become evident until some time after harvesting. Diseased vines have been collected in abandoned hotbeds.

The pycnidial stage develops from the ascospores in 6 to 10 days. Ascospores are formed from the ascogenous strain in 4 to 6 weeks on cereals, but they are always preceded by the formation of pycnidia. Both stages were derived from the same isolation. Inoculations with pure cultures of the pycnidial stage both in the greenhouse and in the field gave successful infection. Successful infections were also obtained from re-isolations. Inoculation on the Potomac Flats with pure cultures of the ascogenous strain gave successful infections. Isolations of the organism were secured in planted plates from green stems of infected plants. Pycnidia, however, form only on the dead or moribund tissues. In the greenhouse, pycnidia occur on the leaves, stems, and roots of inoculated plants. The ascegenous stage fruits well on all cereals tried (corn meal, rice, wheat, barley, oats, rye, buckwheat) and sparingly on sweet-potato cylinders and sweet-potato stems. The disease is disseminated chiefly by the " seed " and by the use of decayed potatoes for manure. Diseased potatoes should be cooked before feeding to stock. They should never be scattered on the fields as a fertilizer. Seed beds should be sterilized and potatoes to be used for seed carefully selected.

1105 - On the Rotting of Potato Tubers by a New Species of *Phytophthora* having a Method of Sexual Reproduction hitherto Undescribed. — PETHYBRIDGE, GEORGE H. in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XIII (N. S.), No. 35, pp. 529-565 + plates XLII-XLIV. Dublin, March 1913.

The writer in his introduction gives a short summary of the literature dealing with the various forms of rotting which occur in the potato tuber. In some cases, it is probable that potato tubers sometimes die what may be called a natural death, or at least one in which the active participation of parasitic organisms does not occur ; but, as a rule, the rotting of potatoes is nowadays regarded as the direct result of the attack of some parasite. Animal pests frequently cause wounds in the skins of the tubers and thus facilitate the entrance of bacteria and fungi. A considerable number of bacteria have been described which are pathogenic to the potato tuber ; to these must now be added *Bacterium xanthochlorum*. There are relatively few fungi which have been proved to be the primary causes of potato rot, the best known being *Phytophthora infestans* De Bary.

Dry rot is generally regarded as caused by *Fusarium Solani* Sacc., but in view of the recent work of Appel and Wollenweber, it is possible that this disease may be due to more than one species. " External dry rot " has been shown to be caused by *F. trichothecioides* Wollenw.

Frank has credited *Hypochnus Solani* Prill. and Del. (= *Rhizoctonia solani* Kühn) with producing wet rot in potato tubers ; the evidence he relied on was, however, inconclusive, and the writer failed in producing the disease by means of inoculation with this fungus. *Rhizoctonia violacea* Tul. is an actual parasite on the potato tuber.

The present paper deals with a new and highly characteristic type of tuber rot which occurs in Ireland (and will probably be found to occur elsewhere) caused by a new species of fungus closely allied to *Phytophthora infestans*, but differing in certain important essentials from the latter. It was first observed in 1909 in plots at the Temporary Station for the Investigation of Plant Diseases established by the Department of Agriculture and Technical Instruction for Ireland at Clifden, Co. Galway, and has since been received from other parts of the country. During the last two seasons, the disease has become of increasing virulence. It is prevalent in the West of Ireland and it seems that the loss in tubers occasioned may be considerably greater than that due to the attacks of *P. infestans*. The disease is particularly virulent on certain portions of land which have been continuously cropped with potatoes (infection taking place from the soil), and it would appear to be quite easy to prevent its occurrence by following a proper rotation of crops, and planting only potatoes derived from clean land. Infection is probably to be accounted for by the fact that some of the "resting spores" of the fungus adhere to the external surfaces of the "seed" tubers ; it seems fairly certain that the disease cannot be transmitted by the presence of the fungus within the tubers, as the rot caused is so rapid that the tubers are destroyed in a few days.

A preliminary notice respecting this disease has been published in the *Journal of the Department of Agriculture and Technical Instructiom for Ireland*, Vol. XII, No. 2, 1912, p. 375.

The method of the development of the sexual organs of the fungus is peculiar and novel. The writer suggests the name *P. erythoseptica* for this hitherto undescribed species of *Phytophthora* and that of "pink rot" for the disease which it occasions. A detailed description is given of the symptoms of the rot, which usually begins at the proximal end of the tuber and progresses rather quickly towards the distal end. In the field or store the rot would probably be regarded as of the "wet" type. The cut surfaces of affected tubers quickly turn pink when exposed to the air, and later become almost black.

The pathogenetic agent has been isolated by placing pieces of infected tissue in suitable media; when inoculated into healthy tubers, the latter became infected. No infection followed in carrots and parsnips, while in the cases of the mangel and swede the rot was neither very rapid nor pronounced. In the white turnip a decided rot was produced, but its progress was not so rapid as in the potato. Inoculation experiments with scarlet-runner beans showed that the fungus was incapable of causing infection through the uninjured skin of the pods.

The writer gives a detailed description of *P. erythroseptica* and its sexual organs. The oogonial incept enters the antheridium at or near its base, grows up through it and out of the top, expanding there to form the oogonium proper in which the oospore develops. It is not certain whether fertilization occurs, but if so it would appear to take place before the formation of the oosphere. The production of oospores and conidia has not yet been seen in or on the potato tuber itself, but it has been observed in cultures grown on various media. *P. eryphroseptica* can be cultivated on such media much more readily than its near ally *P. infestans*. It would appear that the production of oospores is inhibited by acid, and that the conidia are usually produced only under water.

P. infestans de Bary and *P. Phaseoli* Thaxt. agree with *P. erythroseptica* in the manner in which the oospores are produced, while it is highly probable that *P. omnivora* var. *Arecae* Coleman will be found to follow the same mode of development. The sexual organs of *P. Cactorum* Schroet., *Peronospora Fagi* Hartig (*P. omnivora* De Bary) and *Phytophthora Syringae* Klebahn are developed in the manner described by De Bary for his *P. omnivora*, which is usually regarded as typical for all species of *Phytophthora*. The writer suggest that only those species whose sexual organs are developed according to the *infestans*-type should be retained in the genus *Phytophthora*, and that those which follow the *Cactorum*-type should be placed in a new genus for which the name *Nozemia* is proposed. The genus *Phytophthora* thus amended is to constitute, at present, the sole member of the family *Phytophthoraceae*.

An addendum gives further information as regards *P. Faberi*, *P. Nicotianae* and *P. Jatrophae* when grown in pure cultures. The bibliography appended contains 26 works.

1106 – [**On *Phytophthora parasitica* nov. spec., a New Disease of the Castor Oil Plant.** — DASTUR, JEHANGIR FARUNDJI in *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. V, No. 4, pp. 177-231 + X plates (one coloured). London, May 1913.

Hitherto Castor rust (? *Melampsorella Ricini* de Toni) is the only important fungus pest which has been recorded as attacking the castor oil crop at Pusa, and yet two other serious parasites occur there: one is *Phytophthora parasitica* nov. spec., the other is a species of *Cercospora*. The latter attacks the leaves only, but in wet weather about 90 per cent. of the foliage of the castor oil plant is covered with *Cercospora* spots, which is a serious menace to the eri-silk industry. Further in August and September *Choanephora* attacks leaves, growing points, and tender shoots, while there is also an *Alternaria* found occurring on the leaves which might be parasitic. All these diseases will be dealt with in another paper when their study is complete.

Phytophthora on castor was first found at Pusa in 1909 in August. Since then it has been found to appear every year after the rains have set in, in June, while the disease disappears by the beginning of September, at the end of the rains. About 19 varieties of castor were grown on the Pusa Farm in 1911, but none of them escaped the attack of this fungus. *Phytophthora parasitica* is the most injurious of the fungal parasites of castor; it destroys seedlings and attacks leaves of older plants. The silkworms refuse to eat the diseased portions of the leaves and their growth when fed on diseased foliage is very slow as compared with those fed on healthy leaves.

In the case of a monsoon (Kharif) crop, the most critical time is when the seedlings are about six to eight inches high and their stems are quite tender. In low-lying, water-logged, and badly drained fields, about thirty to forty per cent. of the seedlings damp off. The first indication of the disease is the appearance of a roundish patch of an unhealthy dull green colour on both surfaces of the cotyledon, which soon hangs down from its point of attachment. The disease spreads from the leaf to the petiole, thence to the stem and the growing point, killing the seedling. In older plants, the disease in the field is localised on the lamina. As the diseased spot gets older it turns yellowish and then brown. It spreads concentrically, and in old spots forms concentric brown rings enclosing lighter brown areas. Sometimes the diseased areas become confluent. The affected leaves have a tendency to fall off prematurely.

The mycelium is both intracellular and intercellular. The long unbranched sporangiophores emerge through the stomata, or between the walls of two contiguous cells. Internal sporangia have often been observed in the tissues of the leaves, stems and fruits; in a few cases they have been seen to germinate conidially in the soft tissues of the pericarp of the fruit. The writer has, so far, failed to find typical oospores in nature.

Inoculation experiments were made using a fragment of diseased leaf, a little mycelium, or zoospores from cultures of the fungus. In all cases the effect of the inoculation was clearly perceptible within 24 hours, and sporangia were produced in 48 hours after the operation, provided the inoculated leaf was kept moist. The germ tubes of the zoospores penetrated the leaf, either through a stoma, or by breaking through the upper wall of the epidermal cells, or by penetrating between the walls of two neighbouring cells. Infection experiments were also successful in the case of flowers and fruits, though these are not attacked under natural conditions. Seedlings planted in infected soil gave first positive results, and subsequently negative results at the end of two months; this shows that the fungus in the soil was not able to retain its vitality for two months.

The writer describes in detail the technique of pure cultures, the morphology of this fungus in culture as compared to that of its allies, the different nutritive media used and the inoculation experiments carried out on various host plants by means of suspending motile zoospores of *Ph. parasitica* (obtained from pure cultures) in distilled water. The results were positive in the cases of young plants of *Solanum tuberosum* and of seedlings of *S. Lycopersicum* and *S. Melongena.* The disease remained localised on inoculated mature leaves. Potato tubers could be inoculated only through wounds; tomato fruits could not be inoculated, even when wounded, and in no case was there any formation of sporangia. Lilac plants did not take the inoculation vigorously. Two species of *Oenothera* were readily infected by inoculation, as were young seedlings of *Salpiglossis variabilis*, *Gilia nivalis* and mixed species, *Clarkia elegans*, *Schizanthus retusa* and mixed species and *Fagopyrum exulentum.* About fifty per cent. of *Sesamum* *indicum* sown in a field where castor was grown the previous year were attacked by *Phytophthora*, and successful cross inoculations showed that the fungus was the same as the castor *Phytophthora*. Negative results were obtained by inoculating *Opuntia Dillenii*, two species of *Cereus*, cacao fruits and apples, *Colocasia antiquorum*, *Lepidium sativum*, *Panax*, tobacco, *Cleone* sp., four species of *Jasminum*, *Phaseolus lunatus* and *Phaseolus vulgaris*.

The infection experiments showed that some of the plants that were susceptible to infection by *Ph. omnivora*, *Ph. omnivora* var. *Arecae* and *Ph. Faberi* can be inoculated also by *Ph. parasitica*.

Nevertheless, the study of these fungi in pure cultures showed very little in common between them; the latter is distinguished from the others especially by the method of the development of its sexual organs. On no other *Phytophthora* except *P. Colocasiae* has the oogonium been invariably found to originate from within the antheridium, or to arise from a separate stalk which penetrates the antheridium and grows through it.

After establishing the differences between *Ph. parasitica* and its allied species, the writer gives a botanical description of the former.

1107 – **Diseases of Rubber, Cacao and Cotton Observed in Southern Nigeria in 1912.** — *Annual Report on the Agricultural Department for the Year* 1912, pp. 6-9.

The fungus flora so far observed of economic plants in Southern Nigeria is very similar to that of Southern India, Ceylon, Malaya, Java, and the East generally. The following diseases have been recorded by Mr. C. O. Farquharson, mycologist of the Agricultural Department of Southern Nigeria, in the course of his tours of inspection in the different districts.

Rubber Diseases. — Two fungi have been found in the colony causing decay of the roots of the Para trees (*Hevea brasiliensis*); these are *Fomes semitostus* Berk. (*Polyporus lignosus* Klotzsch) and *Hymenochaete noxia* Berk. The best method of controlling the first is to get rid of all infected material, to treat the soil with quicklime, and to check the advance of the mycelium by digging a circular trench at some distance from the affected tree. As the fungus also grows on the decaying bush stumps, it is necessary to have these removed. *Hymenochaete noxia* is easily recognised by the manner in which the mycelium binds together a mass of sand grains and small stones to the surface of the roots. The stem disease (*Corticium salmonicolor* B. et Br.) is not uncommon in the Sapele district; trees are most commonly attacked at the forks and in consequence the whole crown very often dies.

Cacao Diseases. — *Hymenochaete noxia* Berk. is not rare on roots of cacao trees. One case of *Fomes semitostus* Berk. was found in the Agege district, but so far its occurrence on cacao seems to be exceptional. The cause of cacao "canker" may still be regarded as a matter of dispute; it has been ascribed to two different fungi at least: *Phytophthora Faberi* Maubl. and *Spicaria colorans*, an imperfect stage of a *Nectria*. Another fungus which produces effects very similar to "canker" has been found on all parts of the plants except the roots and the fruits. This appears to be the most serious cacao disease in the Colony and a full description will be published as soon as possible. Brown rot due to *Thyridaria tarda* Bancroft, and a disease caused by *Nectria Bainii* Massee have both been noted on the pods. Pod anthracnose is not uncommon; it may be provisionally attributed to *Colletotrichum theobromicolum* Delacroix.

Cotton Diseases.—Many cotton seedlings were attacked by "sore shin", a disease which does not seem to be due to any specific organism. American cottons are chiefly affected by physiological diseases, such as "red rust" which is characterised by the leaves early in the season turning a reddish purple colour, especially in the spaces between the veins. The leaves soon fall off, their fall being hastened by the presence of fungi. This occurs during periods of excessive rainfall, when the soil is not properly aerated, or through failure of rainfall, and the condition was most marked in Agege cotton. In a disease known as "shedding of forms", the plant produces more "forms" than could mature as bolls; the shedding of these superfluous forms, if excessive, is, however, due to unsuitability of soil. Leaf spot of cotton is of obscure origin; it is probably caused by variations in temperature and humidity. The affected leaves are covered with greyish brown spots with a dark purple border. In all the cotton districts areolate mildew is very common; it is produced by a fungus, *Ramularia areola* Atk., but causes little damage. Other cryptogamic diseases are cotton anthracnose, due to *Colletotrichum Gossypii* South, boll rot caused by a species of *Diplodia* and cotton rust which is widespread and produced by *Uredo Gossypii* South.

The native cottons are of two distinct varieties, the Meko, a green-seeded form, and the naked-seeded Ishan variety. Both are subject to "leafcurl", a disease which distorts the leaves, the younger branches and the upper parts of the plant, and restricts flowering. The disease is still under investigation. Another disease almost peculiar to the native cotton and of which the origin is not clear is characterised by a blackening of the midrib and main veins of the leaves and is associated with the presence of numerous bacteria and a *Fusarium*. It was not found on any of the North American cottons, but occurred on Brazilian cotton which bears several botanical characters suggesting a relationship with the native varieties.

1108 - **Some Diseases of the Sweet Pea.** — TAUBENHAUS, J. J. and MANNS, THOS. F. (Dept. of Plant Pathology, Delaware College Experiment Station, Newark, Delaware, U. S. A.) in *The Gardener's Chronicle*, Vol. LIV, No. 1385, pp. 21-25. London, July 12, 1913.

The sweet pea (*Lathyrus odoratus*) is subject to various bacterial and fungous diseases, some of which are described and figured in this article.

The Mosaic Disease. — This disease is easily recognised by the yellow dotting or mottling of the leaves. In varieties with thick leaves, this mottling is associated with curling; when the leaves are thin and delicate, they turn yellow and drop prematurely; in very advanced stages, the disease is also noticed on the stems.

Infected seedlings often outgrow the disease entirely and make a healthy new growth at a later period. Badly diseased plants often bear flowers, but these occur either on very short peduncles or they have curled and distorted petals and the colour of the blossom is faded. All varieties, with the exception perhaps of the dwarf varieties, are subject to the disease. Other leguminous plants which suffer from a similar mosaic affection are *Trifolium pratense* and several forage species of *Lathyrus*. The mosaic disease of the sweet pea may be induced artificially by inoculation. Under field conditions the green aphids appear to be active agents in the distribution of the malady, while the latter may be reproduced in the laboratory by transferring green aphids from infected plants to healthy ones.

Root Rot caused by *Thielavia.* — Chittenden and Massee have suspected the fungus *Thielavia basicola* to be the cause of the streak disease of the stem. This the writer has shown to be of bacterial origin and related to a bacterial disease of the clovers. Plants affected by *T. basicola* have little, or pratically no, root system; they remain very dwarfed and are useless for flower production. Healthy seedlings are readily infected by placing this fungus on the root of plants growing in sterile soil.

Root Rot caused by *Rhizoctonia* (*Corticium vagum*). — This fungous disease is common to many seedlings, *viz.* lettuce, tomato, tobacco, pea and others. Severely infected plants have scarcely any root system; in less infected seedlings, only one or two rootlets may be destroyed.

Stem or Collar Rot. — This is due to *Sclerotinia libertiana*; it is usually a seedling disease, though it may attack plants of all ages. The same fungus causes a drop disease of lettuce and of other plants. Stem-rot occurs chiefly in poorly ventilated houses, in over - watered, badly drained beds, and in damp places out of doors. The disease spreads very rapidly and is soon fatal. The fungus penetrates the collar of the stem and completely invades the vessel of the plants, thus clogging the upward flow of the water from the roots to the stem. Affected plants first show a wilting of the tip and flagging of the leaves, and finally the seedlings collapse. *S. libertiana* is a soil organism which occasionally causes root trouble on clover. It is sometimes introduced with animal manure.

Fusarium Wilts or Root Rots. — These are caused by two distinct fungi which produce the same symptoms, namely a wilt and root rot. Seedlings are affected when they reach the height of about 8 to 10 inches, when they wilt and collapse. The bark or cambium is destroyed by the fungus. The rotting seedling becomes a breeding place for flies, which carry the spores to healthy plants; rain and running water also distribute the disease. These species of *Fusarium* are as yet undetermined, but more work on them is in progress.

Root Galls (*Eel worms*). — These swellings are produced by *Heterodera radicicola*. The disease is a common greenhouse trouble, where it attacks roses, violets, carnations, begonias, lettuces, cucumbers and tomatos. It is not often met with in the field, and is introduced into the greenhouse with infected soil or manure.

Bud Drop or Failure to set Blossoms. — The buds appear on apparently healthy plants, but quickly wither and finally fall. The disease results from the use of a too highly nitrogenous food ration, poor in mineral elements, especially phosphorus and potassium. The writer successfully controlled this trouble within a week by the application of phosphoric acid and sulphate of potash.

Anthracnose. — A disease due to *Glomerella rufo-maculans* (B.) Sp. et Usch., which is sometimes manifested in a wilting and dying of the tips; at other times the disease spreads downwards and involves the entire branch. On leaves the disease starts as whitish spots which enlarge and involve the whole area. At the time of blossoming the fungus attacks the peduncle and sometimes the flower bud as well, and causes them to dry up. Infected pods shrivel and are covered witl salmon-colour patches. *G. rufo-maculans* also causes the bitter rot of the apple and the ripe rot of grapes. Cross-inoculations by Sheldon and Taubenhaus have definitely proved that the fungus can go back from the apple to the sweet pea and vice versa, in each case producing the typical symptoms of the disease. Anthracnose is of great economic importance. When once introduced into a field the disease spreads rapidly, often destroying the whole crop. It may attack young seedlings in the greenhouse. In field conditions the disease starts abont July 1; it is carried over winter on cankered limbs and mummied fruit of diseased apples, or on the diseased pods and seeds of the sweet pea, and also in the soil.

Powdery Mildew. — This disease is very prevalent on greenhouse sweet peas and on irrigated fields and low land, or where plants are grown too thickly. Usually, however, in small garden lots, especially if these are not watered, the disease is practically unimportant, as it is usually very mild during the active growing season and becomes more abundant only when the plants have served their purpose. Massee attributes the sweet pea mildew in England to *Erysiphe polygoni*. So far, only the conidial or oidium stage has been found in the United States, so that the identity of the fungus there is as yet not definitely established.

1109 — **Diseases of Raspberry and Loganberry.** — *Board of Agriculture and Fisheries, Leaflet No.* 269, pp. 3 + fig. London, April 1913.

During recent years the canes of raspberies and loganberries in Great Britain have been observed to suffer to a considerable extent from the effects produced by microscopic parasitic fungi, which are stated to be yearly extending their range of activity. These fungi have been known for more than half a century as parasites on wild roses, brambles, and other rosaceous plants, and their rapid recent extension does not imply any increased power of parasitism, but is simply due to the larger number of suitable host plants grown in juxtaposition.

Hendersonia Rubi Westendorp is responsible for most of the injury caused to raspberries and loganberries. The canes are first attacked, infection taking place during the summer.

The first indication of the presence of the parasite is, as a rule, the appearance of lurid red or purplish patches on the young stem; during the winter these patches become grey or white owing to the bark having been killed. These dead parts of the bark are then thickly scattered over with the minute black fruits of the fungus, which contain myriads of coloured four - celled spores. When mature these spores escape into the a ir and thos that alight on young shoots germinate and enter the tissues, thu s ensurin the continuance of the disease in the next season. When several disease, patches are present the canes are killed outright during the winter, wherea when only one or two affected areas are present, the cane may survive an produce a certain amount of fruit. It is well however, to remove and burn a canes even if slightly attacked, as it is only by such means that the diseas can be eradicated. Infection mostly takes place at the period of the yea when fruit is present, hence spraying cannot be practised unless the frui is sacrificed, when Bordeaux mixture should be used. Even in these cir cumstances every diseased cane should be cut down the moment it is observed.

Ascochyta pallor Berk. sometimes occurs as a parasite on the stems of raspberries, roses and brambles. It forms whitish dead patches studded with black dot-like fruits, Treatment should be similar to that suggested in the case of *Hendersonia Rubi.*

1110 - A Disease of Greengage Trees Caused by *Dermatella Prunastri* Pers.

— DOWSON, W. J. in *The New Phytologist.*, Vol. XII, No 6, pp. 207-216, 3 figs. London, June 1913.

This disease has been observed for some years in the greengage plantations at Willingham and Cottenham near Cambridge. The writer carried out his investigations upon it in the Botany School, Cambridge. The disease attacks branches of all sizes and belonging to old or young trees. The dead branches were easily distinguished from healthy ones by the fact that they were covered with *Pleurococcus* sp. and lichens. The pycnidia and apothecia of *Dermatella prunastri* occurred chiefly on the distal end of the branches, though sometimes they were observed at the base. Much gum was produced in the diseased wood. The tissues invaded by the mycelium became discoloured and died. The hyphae were most abundant a short distance behind the junction of discoloured and healthy tissue.

The writer gives the synonyms of the fungus, a detailed description of the latter, together with a description of the disease and the results of field, culture, and inoculation experiments. The results so far may be thus summarized:

1) *Dermatella prunastri* Pers. has been grown in pure culture from conidia and from ascospores. 2) The mycelia arising from both these kinds of spores, when growing on nutrient agar and sterilised pieces of greengage wood and bark, produced pycnidia after some three weeks' growth. (3) The mycelium was found present in all the tissues of the host and particularly in the wood and pith. 4) The vessels, tracheids and fibres are not delignified, and the hyphae pass from one cell to another by way of the pits. 5) The my-

celium advancing up a branch is preceded by gumming in the woody elements. 6) The inoculations of healthy greengage trees with the mycelium of *Dermatella prunastri* led to infection.

1111 – *Peridermium Laricis* a Parasite of *Larix europaea* in Scotland. —

BORTHWICK, A. W.. and WILSON, MALCOLM in *Transactions of the Royal Scottish Arboricultural Society*, Vol XXVII, Part II, pp. 198-202 + fig. Edinburgh, July 1913.

The writers found upon some leaves of larch (*Larix europea*) sent from Fersit in Inverness-shire a fungus which, although not agreeing in all respects with *Aecidium* (*Peridermium*) *Laricis* described by Klebhan (*Zeitschr. f. Pflanzenkr.*, Bd. IX, 1899, p. 14), differed too slightly from the latter to justify the creation of a new species.

The parasite appeared early in the season and was fully developed on leaves when they were about three weeks old; the branches shed their diseased leaves at the end of July. The fungus was almost always found on the under surface of the leaves but occasionally it occurred on the upper side.

Coeoma Laricis bears a considerable resemblance to the form just described as occurring on the larch; it is however at once distinguished from *Peridermium Laricis* by the entire absence of the pseudoperidium, as well as by differences in the sculpturing of the spore wall. *Coeoma Laricis* has been shown to be the aecidial stage of six different species of *Melampsora* in which the uredospore and teleutospore stages occur on various species of *Populus* and *Salix*. Klebahn, by infection experiments commenced in 1896 in the neighbourhood of Hamburg, proved that *Peridermium Laricis* is the aecidial condition of the cryptogam then called *Melampsora betulina*, but for which he proposed the name *Melampsoridium betulinum*, establishing the difference between the two genera as follows:

Melampsoridium: aecidium of the *Peridermium* type, uredospore sorus with a definite pseudoperidium.

Melampsora: aecidium of the *Coeoma* type, uredospore sorus surrounded by capitate hairs, but without a definite pseudoperidium.

Saccardo (*Sylloge Fungorum* XXI) records the presence of *Peridermium Laricis* in France and Germany; Arthur and Kern include it in their list of North American species, for *Melampsoridium betulinum* is common in N. America, but the stage on the larch has not yet been found in that country. Considering the abundance of *Melampsoridium betulinum* in Scotland it is a remarkable fact that *Peridermium Laricis* is of such rare occurrence. Its resemblance to *Coeoma Laricis* may however partly explain the absence of previous records. It is possible that *Melampsoridium betulinum* really consists of several physiological species and that *Peridermium Laricis* is only one of its aecidial forms; this supposition may explain the absence of records from North America.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

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1112 – **Broom as one of the Chief Centres of Distribution of Dodder in Mountainous Districts.** — MODONESI, M. in *Il Coltivatore*, Year XIX, No. 18, pp. 569-571, 1 fig. Casalmonferrato, June 3, 1913.

The writer, basing his observations on his personal experience, draws attention to the fact that the solitary broom bushes which grow on the steepest slopes, often act as hosts of dodder, thus disseminating the pest over the adjacent plain. He advises careful watching and the burning of all infected bushes.

INSECT PESTS.

ERALITIES

1113 – **Insect Pests and Cryptogamic Diseases observed in the Barbados and West Indies, during 1911-12.** – *Imperial Department of Agriculture for the West Indies, Report on the Botanic Station, Montserrat*, 1911-12, pp. 16-17. Barbados, 1913.

Insect Pests. Maize is liable to few fungoid pests, but is invariably attacked by the "corn ear worm" (the larva of *Laphygma frugiperda*). The eggs are laid on the grown up plants; the larvae attack first the leaves and later the stem of the plant. The first indications of the presence of the parasite are shown in the changes taking place in the young unfolded leaves.

Experients have been tried with Paris green in powder and solution, alone and mixed with lime, but owing to the scorching of the leaves it is of no use. Arsenate of lead has proved the most effective insecticide for this pest. It cannot be applied alone as it scorches the foliage, but mixed with four times its weight of lime or used as a solution in water (1 in 160). The latter method, however, is not so effective.

Paris green has also been effective in dealing with the attacks of the "Bengal bean caterpillar" (*Thermesia gemmatalis*) on *Mucuna utilis*. When applied as a mixture with six times its weight of lime it is liable to produce scorching of the leaves, but not defoliation. Arsenate of lead in similar proportions has no injurious effects.

On the Cotton plant, *Dysdercus andreae* and *D. delauneyi* have occurred and caused considerable destruction in the plantation during 1911.

The "cotton flower bud maggot", which attacks cotton in Antigua, has been definitely identified as being *Contarinia gossypii*.

Towards the end of 1911, the "Chaff scale" (*Parlatoria pergandii*) was discovered attacking Citrus plants at Grove station, and as it has not been observed outside the station it would appear to be a recent introduction.

The chief insect attacking the coconut in this island appears to be the Bourbon scale (*Aspidiotus destructor*), which is common on the leaves but cannot be regarded, as a serious pest.

Fungus diseases. Ground Nut Rust (*Uredo arachidi*). Further experiments were tried with 5 varieties divided into two series, one half sprayed with Bordeaux mixture on two occasions. The first application was given 27 days after planting before the pustules had appeared, and the second 32 days later (Sept. 19) when the fructifications had begun to appear. All the varieties were attacked, but less disease developed on the sprayed plots. The effect of the spraying on the yield of nuts is given below.

Variety	Yield in lbs.	
	Sprayed	Unsprayed
Carolina Running	145	126
Carolina Running (Small seeded)	81	93 ½
Gambia	108	122
Gambia (3-seeded)	114	115
Spanish	84	58 ½

As the results are not consistent, it has not been demonstrated that the fungus was in past years responsible for a shortened crop, or that it affected the quality of the nuts in any way.

Cotton Boll Soft Rot. — The mycologist suggests that a species of *Pythium* or *Phytophthora* is the probable cause.

It is particularly prevalent in damp seasons and damp localities, and causes considerable losses.

1114 – **The Argentine Ant *(Iridomyrmex humilis Mayr.)*.**— NEWELL, WILMON and BARBER, T. C. — *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 122, pp. 98 + XIII plates + 13 figs. Washington, June 26, 1913.

The Argentine Ant is the most injurious of the Formicidae in the United States and the writers believe that its depredations will extend as far as S. Califormia and the Gulf States. This paper gives the results of 5 years experiment at Baton Rouge, La., and at New Orleans.

I. humilis was first noticed at New Orleans in 1891 and has spread with great rapidity until it is now the foremost household pest and extends its ravages to the majority of crops grown in the South.

It is indigenous to the Argentine and Brazil and was accidentally introduced into Madeira, where it exterminated another ant (*Pheidole megacephala*), which was itself an introduced species, and had exterminated the native ant before it. Its occurrence has been recorded in Portugal, Capetown and Chile. It has thus established itself as a nuisance in four continents, and owing to its dissemination through the ordinary channels of commerce, it is reasonable to expect that it will eventually invade all the semitropical countries of the globe. There is every reason to believe that it was introduced into New Orleans by the coffee ships from Brazil and that it has spead by means of the railroads and driftwood. It is not definitely known at what altitude this insect is unable to thrive, but it is safe to assume that it could not extend its ravages beyond the minimum isotherm of zero.

Under natural conditions the rate of dispersal of these ants is very slow, some few hundred yards a year, but when food is plentiful (such as secretions of aphides or scale insects) nothing short of running water will stop them.

Of the means of dispersal there is no doubt that floating drift wood and the transportation of freight are the most important, and that the nuptial flight of the queens takes no part at all, owing to their inability to rear the grubs.

Up to the present it has attracted most attention as a household pest. During the rainy season, or when their natural diet is scarce, they invade the houses in myriads and almost drive the occupants to distraction.

The damage to plant life is due chiefy to the protective care which they bestow on scale insects and plant lice, and to their attacks on blossoms in pursuit of nectar. Owing to its fondness for the sugar cane mealy bug (*Pseudococcus calceolariae*) it is almost impossible to check the ravages of this bug where the ant is present.

In cotton plantations and corn fields the occurrence of this ant is responsible for large increase in the swarms of aphides and lice.

It is a veritable plague among honey bees and poultry, so that bee-keeping and chicken rearing become impossible.

The only substance that has been found to protect sitting hens is zenoleum powder, liberally sprinkled in the nest and among the hen's feathers from time to time during the brooding period.

Another form of injury is due to the destruction of beneficial native species of ants, such as the "fire ant" (*Solenopsis geminata*) which destroys larvae of boll weevils. Lastly, it may also be an important agent in the spread of disease in unsanitary districts.

The only activities of this ant that can be considered at all beneficial are concerned with the destruction of bed bugs, "chiggers" or so-called "red bugs" and the sorghum midge.

The writers give detailed descriptions of the species, methods of study, life history, colonies, habits, accounts of the symbiosis with other insects, the methods of their attack and repression.

Eggs are laid at all seasons of the year, but chiefly in summer. One queen was observed to deposit eggs at the rate of 30 per day, but suspended oviposition for several days at a time. The period of incubation varies from 12 to 55 days according to the temperature, the duration of the larval stage from 11 to 61 days. The pupal stage varies according to the sex, males requiring from 19 ½ to 28 days, workers from 12 ½ to 25 days and the queens 3 or 4 weeks. Thus it requires from 33 to 141 days, or an average of 74 days, for the complete development of an individual.

Of the three adult forms, the worker is the smallest (from 2.25 to 2.75 mm.) and lives from 10 to 12 months. The male varies in size from 2.8 to 3 mm., is winged and lives in the spring or (in limited number) in the autumn. The queen measures from 4.5 to 6 mm. and lives for several years. She is winged before fertilisation, but loses the wings afterwards.

The ants facilitate the multiplication of scale insects and aphides by constructing shelters of earth to protect them against adverse atmospheric conditions and parasites.

An invasion of these ants into a plantation is always accompanied by a renewal of the attacks of scale insects in sugar cane plantations and orangeries. The species of aphides and scale insects most favoured by these ants are given in the following list.

On bamboos: *Asterolecanium bambusae* Bdv., *Odonaspis secreta* Ckll., *Odonaspis inusitata* Green.
On banana: *Coccus hesperidum* L., *Chrysomphalus aonidum* L.
On cotton: *Aphis gossypii* Glov.
On corn: Undetermined aphis (probably *Aphis maydis* Fitch).
On figs: *Pseudococcus citri* Risso, *Lecaniodiaspis* sp., *Aspidiotus camelliae* Sign.
On hickory, elm, hackberry and various shade trees: *Pseudococcus* sp., *Ceroplastes cirripediformis* Comst., *Ceroplastes floridensis* Comst., *Chionaspis longiloba* Cooley, *Chionaspis americana* Johnson.
On magnolias: *Neolecanium cornuparvum* Thro., *Aspidiotus camelliae* Sign., *Toumeyella turgida* Ckll.
On mulberries: *Chrysomphalus tenebricosus* Comst.
On oaks: *Kermes galliformis* Riley, *Eulecanium caryae* Fitch., *Eulecanium quercifex* Fitch, various aphidids.
On orange: *Coccus hesperidum* L., *Parlatoria pergandii* Comst., *Lepidosaphes beckii* Newm., *Lepidosaphes gloverii* Pack., *Chrysomphalus aonidum* L., *Aphis gossypii* Glov., also the white fly, *Aleyrodes citri* R. and H.
On palms and other ornamentals: *Coccus hesperidum* L., *Eucalymnatus tassellatus* Sign., *Aspidiotus lataniae* Sign., *Aspidiotus hederae* Vall., *Chrysomphalus dictyospermi* Merg.
On peach, pear, and other fruits: *Aspidiotus perniciosus* Comst., *Aulacaspis pentagona* Targ., various aphidids.
On persimmons: *Ceroplastes cirripediformis* Comst., *Eulecanium corni* Bouché, *Pulvinaria vitis* L.
On strawberry: *Aphis forbesi* Weed.
On sugar cane: *Pseudococcus calceolariae* Mask., *Aphis gossypii* Glov.
On sweet gum: *Cryptophyllaspis liquidambaris* Kotinslky.
On various shrubs: *Coccus hesperidum* L., *Saissetia oleae* Bern., *Pulvinaria cupaniae* Ckll., *Aspidiotus lataniae* Sign., *Chrysomphalus aonidum* L.
On willows: *Eulecanium nigrofasciatum* Perg., *Pseudococcus* sp., (near *citri*), *Chionsaspis salicis-nigrae* Walsh, *Aspidiotus perniciosus* Comst., various undetermined aphidids.

An interesting factor concerned with the remarkable increase of scales and aphis which invariably accompanies infestation by this ant is the persistence with which the ants drive away the ladybirds which attempt to prey upon the insects fostered by them and it is extremely rare that a ladybird can be found at all on the infested trees.

The Argentine ant is destructive of nearly all other forms of insect life, any insect which it is able to hold in its jaws being suitable prey.

The natural enemies of this ant are remarkably few. Their destruction has been recorded by cockroaches (*Thyrsocera cineta*), spiders (*Theridium tepidarium*), birds (English sparrow and yellow hammer) and parasitic mites (*Pediculoides ventricosus*), but none of these are sufficiently effective to be of any economic importance. Experiments in the cryptogamic parasites (*Sporotrichum globuliferum, Bacillus larvae*) have also given negative results.

Methods of repression. — The only effective methods are those based on the actual destruction of the ants themselves, and these efforts must be directed against the queen ants as the progenitors of the race. As never more than 10 per cent. of the workers are required for foraging, their destruction does not seriously affect the rate of increase of the colony. Repellents are only of use in protecting food stuffs. As the result of numerous experiments, the use of running water and zenoleum powder have been found most effective. Coal-tar, pine-tar, tobacco dust and sulphur were found to be ineffective. Crude petroleum of all liquids was found to be most repellent. "Ant tape" soaked in corrosive sublimate is very effective in isolating tables and furniture generally. Cyanide used either as solution or fumigant was useless, but injections of carbon bisulphide gave good results. The writers also experimented with poisoned foods in the hope of finding a substance that would be included in the diet of the colony. A paste of 1 part arsenate of lead and 2 parts honey, and a solution of 0.25 gm. white arsenic and 20 grams sugar in 100 c. c. of water proved effective in destroying portions of the colony and in driving the remainder away from the vicinity.

Various devices have been constructed for preventing the invasion of bee hives by this pest, but on a commercial scale the cost is so prohibitive that the wisest course is to remove the apiary to an uninfected locality.

In orangeries "ant ditches" are constructed and supplied by pumps. Divided bridges with a 2 inch cleft through the middle are used to prevent the passage of the ants.

Flooding the ground and driving the ants to certain restricted areas has been successfully resorted to.

Winter trap boxes containing decaying vegetable matter are useful in collecting the colonies in winter, but clean surface weeding is essential to trapping all the colonies. Carbon bisulphide is used to destroy the colonies in the boxes.

A bibliography of 4 works is appended.

1115 - **Rice Water Weevil *(Lissorhoptus simplex)*.** — TUCKER, E. S. (Associate Entomologist, Louisiana Agricultural Experiment Station, Baton Rouge) in *The Rice Journal and Southern Farmer*, Vol. XVI, No. 7, p. 2. Crowley, Louisiana, July 1913.

This insect is the most serious pest of the rice crops in the Southern States. The adult appears only at night and is attracted in swarms by a bright light.

The writer has found dead specimens in Honduras rice and concludes that the weevils are not a menace to stored grain, but that they seek refuge on the sheaves of harvested rice in the filed and find their way through the thresher with the grains. He has found as many as 3 dead weevils in a sample of rice weighing 15 ounces, and the stock was of the previous season's harvest.

1116 - Observations on *Pseudococcus bakeri* Esssig ("The Walnut Mealy Bug"). — VAILE, R. S. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 554. Sacramento, California, June 1913.

In December 1910 Essig described a new species of mealy bug and identified it as *Pseudococcus bakeri*. Since then he has observed the following host plants: walnut, apple, pear, orange, lemon, pomelo, elder, cottonwood, black walnut, nightshade and a few ornamental shrubs. On the elder and nightshade it appears to live primarily on the roots, and numerous solanum bushes have been found with the roots thickly covered with all the stages from eggs to mature adults. This is also true of elder, but it has not been observed on the roots of citrus or other fruit trees.

The life history appears to be much the same as that of *P. citri*, except that the egg masses are much looser and the number of eggs laid per female is less.

The average number of eggs per mass of *P. citri* is 274, whilst that of *P. bakeri* is about 67. Considering the lower fertility of the eggs of *P. bakeri* (10 to 20 % infertile) it does not seem probable that it will ever be classed as a damaging insect, and it seems to require no additional control measure. The writer suspects the presence of egg parasites, though up to the present it has not been demonstrated.

Carbolic acid emulsion and other sprays are effective against both species of *Pseudococcus*; fumigation is more efficient against *P. bakeri* than against *P. citri*.

MEANS OF PREVENTION AND CONTROL

1117 - Sweet-Corn as a Culture-Trap for *Heliothis obsoleta* Hübn. ("Cornworm"). — COOK, A. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 555. Sacramento, California, June 1913.

Known variously as the "corn worm", "corn ear worm", "tomato worm" and "cotton boll worm", it has a decided preference for sweet-corn. This fact may be of great use to the tomato grower, for by planting a row of corn in place of every tenth row of tomatoes the moth is attracted from the less inviting tomato plants. Dusting or spraying with lead arsenate will save the corn; on a small scale it may be saved by hand picking.

1118 - Arsenate of Lead as an Insecticide against the Tobacco Hornworms. — MORGAN, A. C. and PARMAN, D. C. — *U. S. Dept. of Agriculture, Bureau of Entomology, Circular* No. 173, pp. 10. Washington, 1913.

The results of 5 years' experiments conducted by the Bureau of Entomology in Tennessee, Kentucky and adjoinging States. The former method of handworming having become too expensive has been replaced by the use of arsenate of lead as an insecticide. Paris green has been tried, but owing to damage by scorching of leaves and weakening of the leaf-stalk its use had to be abandoned. Arsenate of lead can be applied at any stage of growth, does not damage injured leaves and causes no irritation to the operator.

In applying arsenate of lead to tobacco plants it is necessary to mix it with some carrier to ensure even and thorough distribution. The best carrier for this purpose has been found to be finely sifted freshly burnt wood ashes, an equal bulk of the ashes being used.

The arsenate should be of the di-plumbic form, as it contains a greater percentage of arsenic acid. The applications should be made when the dew is on the plants. For young plants an application of 3 ½ lbs of arsenate of lead per acre is sufficient, whilst full-grown plants require not less than 5 lbs. per acre. If spraying is adopted, a solution of 3 to 4 lbs. of arsenate in 100 gallons of water is required.

INSECTS INJURIOUS TO VARIOUS CROPS

1119 – **Insects injurious to Cotton in Burma.** — SHROFF, K. D. — *Department of Agriculture, Burma, Bulletin* No. 8, 1912, pp. 40 + 15 plates. Rangoon, 1913.

All efforts to introduce superior types of foreign cotton have hitherto proved abortive, and no variety is reported to have become established. At Mandalay almost all the plots of exotic cottons were found to be hotbeds of destructive insects. Local varieties suffer periodically from attacks of aphis (*Pya*), chafers (*Podigaung*), and crickets (*Payit*), especially when young, but as a rule the plants are healthy and free from disease.

The following list contains the varieties observed at the experimental station at Mandalay and during a tour of inspection in the cotton districts of Sagaing, Lower Chindwin and Myingyan (1908). The writer gives for each variety the indigenous name, a detailed description to accompany the figures, and the methods of combatting the pests.

Earias fabia Stoll., *E. insulana* Boisd.	(« The Spotted Boll Worm ») (1).
Gelechia gossypiella Saund.	(« The Pink Boll Worm ») (1).
Sylepta derogata Fabr.	(« The Cotton Leaf Roller ») (1).
Diacrisia obliqua Wlk.	(« The Hairy Caterpillar ») (2) (3).
Dysdercus cingulatus Fabr.	(« The Red Bug ») (1).
Oxycarenus laetus Kirby.	(« The Dusky Bug » (1).
Aphis gossypii Glov.?	(«The Aphis ») (1).
Fam. *Jassidae.*	(« The Leaf Hopper ») (1).
Cerococcus hibisci Green.	(« The Brown Coccid ») (1).
Two species not identified.	(« The Mealy Bugs ») (2).
Acridium aeruginosum Burm.	(« The Black Spotted Grasshopper ») (2).
Brachytripes achatinus Stoll and *Liogryllus bimaculatus* De G.	(« Field Crickets ») (2).
Species not identified.	(« Chafer Grub ») (3).
Zeuzera sp. and *Alcides* sp.	(« Borers ») (3).

(1) Attacks indigenous as well as exotic cotton, but causes more damage to the latter.
(2) Attacks several plants, amongst them, cotton.
(3) Do not cause serious damage.

1120 – **The Spotted Beet Webworm** ***(Hymenia perspectalis* Hübn*).*** — CHITTENDEN, F. H. — *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 127, Part I, pp. 11 + figs. Washington, May 31, 1913.

The author recorded the spotted beet worm in the District of Columbia in 1905 and again in 1912 without the insect having made an appearance in the interval. In 1912 it caused great damage to the sugar beets and various ornamental plants in gardens and glass houses. It is probably of African origin, and though not known in Europe it will probably in time become cosmopolitan. As a pest it has been observed only at Brooklyn, N. Y, and Washington, D. C.

The larvae are nocturnal in habits and conceal themselves about the bases of the plants near the roots and under portions of leaves or petioles resting on the ground. When full grown they are green in colour and about 10 mm. in length. Before pupating they turn pale and yellowish. The cocoon is formed on the plant or on the ground, and is covered with more or less webbing with occasionally a black excrement.

The larvae have been found on ornamental plants such as *Telanthera versicolor* and *Andresine lindeni.*

If has been found associated with other insects, namely the yellow-necked flea beetle (*Disonycha mellicollis* Say), the spinach flea bettle (*Disonycha xanthomeloena* Dalen) and the Hawaiian beet webworm (*Hymenia fascialis* Crown). Amongst the natural enemies of this pest are the larvae of the "spined soldier bug" (*Podisus maculiventris* Say) and a small braconid (*Hemiteles* sp.).

The closely related species, *Hymenia fascialis,* has several parasites, and it is very probable that further study and observation will find other natural enemies. As a check on the spread of this pest, spraying with Paris green at the rate of 2lbs. in 100 gals. of water or a mixture of nicotine sulphate 1oz., whale oil soap 4oz. in 4 gallons of water is recommended. Early ploughing in the autumn and a rotation of crops resistant to its attack should be practised.

1121 – **"The Striped Beet Caterpillar"** ***(Mamestra trifolii).*** — MARSH, H. O. *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 127, Part II, pp. 18 + figs. Washington, 1913.

The writer has observed this insect in the Arkansas valley during portions of four years, occurring on sugar beets and lambsquarter (*Chenopodium album*).

The larvae attack the leaves, causing defoliation, from which the plants recover provided the crowns have not been attacked. Three generations have been noticed in the Arkansas valley. The moths make their first appearance in May and deposit eggs, producing a generation in the first half of July. The July generation produces eggs which become moths at the end of August and the third generation larvae mature late, producing pupae which live through the winter in the soil. A single female produces about 500 eggs.

Preventive measures. — Cultivation of the land after harvest breaks open the cells and exposes the pupae to injury from weather and other causes.

There are several predaceous insects which feed on *Mamestra* larvae, *viz. Microdus inedius* Cress., *Meteorus* sp., *Phorocera claripennis* Macq., *Perilloides bioculata* Fab., and *Phidippus coloradensis* Thorell.

Spraying experiments have been conducted and Paris green proved most effective. The following formula is recommended:

Paris green	3 lbs.
Whale oil soap.	6 lbs.
Water	100 gallons.

This should be applied with a field sprayer at the rate of 75 to 100 gallons per acre.

1122 – **The Red Spider on Hops in the Sacramento Valley, California.** — PARKER, WILLIAM B., — *U. S. Dept. of Agriculture, Bureau of Entomology, Bulletin* No. 117, pp. 41 + figs. Washington, May 1913.

This is an account of 18 months' observation and experiment on the red spider (*Tetranychus bimaculatus* Harvey) in the hop districts of the Sacramento valley.

Life history — The eggs are deposited singly and loosely amongst the webs and upon the underside of the leaves. From 10 to 450 may be found on a single leaf. The period of incubation varies from 4 ½ to 10 days according to the state of the weather, and the period of maturity from 8 to 16 days. Sexual differentiation takes place after the second moult, but copulation does not take place until after the third. Parthenogenesis has been observed to take place, the bulk of such offspring being males.

The mites live on the underside of the leaves protected by their webs, and gradually migrate from the lower leaves as they become damaged, to the higher portions of the vines. They do not hibernate on their hosts, but upon violets, mallow (*Malva passiflora*) and morning glory (*Ipomaea*).

Experiments showed that the average female mite can travel over 211 ft. of leaf surface in 10 hours and from 10 to 60 ft. over soil according to the texture. The writer has observed this mite to be almost omnivorous with regard to its host plants, and gives a list of 43 greenhouse and ornamental plants, 41 field plants, shrubs and trees, and 19 herbaccous plants occurring near hopfields, all of which this mite has been found to attack. From the wide range of plants in this list it seems probable that this pest is able to thrive on any form of vegetation in which the pubescence of the underside of the leaves is not so heavy or luxuriant as to prevent direct attack on the leaf tissue.

The first symptoms of attack are the appearance of yellow spots on the leaves. As the mites increase in number the leaves become more "speckled", turn yellowish, dry up and fall to the ground. The decrease in the vitality of the vine results in a premature ripening of the hop cones, decreased yield, and weakening of the roots. The male vines appear to suffer more severely than the female and are sometimes entirely defoliated.

Several insects have been observed preying upon the red spiders, but not in sufficient number to have much effect on the infectation. The most numerous insect was a small anthocorid bug (*Triphleps tristicolor* White). Certain small ladybirds have also been observed.

For preventive measure the writer has found that the cheapest and most convenient insecticide is flour paste (8-100) or a combination of lime-sulphur 36° Baumé (1-100) and flour paste (4-100). It is essential that the vines be thoroughly sprayed. These mites are not affected by any form of dry sulphur. Stripping the vines and burning the leaves is an excellent measure, but not reliable as a complete control. When the mites have reached above the point of stripping, spraying operation should be commenced immediately after stripping. A second spraying is also necessary 7 or 10 days later.

The cost of spraying the different liquids with a machine of 2 acres per day capacity works out as follows:

	Cost per acre
Stripping the vines	8*s* to 9*s*
Spraying twice, each 300 gallons, with flourpaste (8 %)	32*s*
Spraying twice, each 500 gallons	34*s*
Spraying twice, each 300 gallons, with mixture of lime sulphur (10 %) and flourpaste (4 %)	33*s*
Spraying twice with same mixture, using 500 gallons	37*s*

Experiments with flour paste (8 ½ to 10 %) show that it is very effective in fixing the mites to the leaves, but as it has no effect on the eggs a second application is necessary. It is also quite harmless to the folioge and blossoms and does not interfere with the fertilisation of the cones.

It is useful against all attacks of red spider except on sweet peas, carnations, green house roses and plants having a heavy pubescence on the leaves.

The leaves of carnations and greenhouse roses are too smooth for the flour paste to adhere and the old method of washing with the garden hose remains the best method in this case.

Appended is a bibliography of 27 works.

1123 – A New Fruit and Truck Crop Pest (*Irbisia brachycerus* Uhler). – VOSLER, E. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II. No. 6, pp. 551-553. Sacramento, California, June 1913.

This pest was reported as a small black plant bug damaging the fruit of peaches and garden crops generally. Weeds of uncultivated land and garden vegetables, especially radishes and rhubarb, were found attacked. The absence of eggs and immature stages led to the conclusion that the insects had emigrated in search of food from other host plants that had been exhausted.

Owing to the large area of distribution, contact poisons would be useless and the writer recommended a good repellent such as Bordeaux mixture in place of an insecticide.

This capsid pest has been identified by Van Duzee as *Irbisia brachycerus* Uhler, which was redescribed as *Capsus solani* by Heideman.

1124 - **The Occurrence of Woolly Aphis *(Schizoneura lanigera)* in the Core of Apples.** — HEWITT, THOMAS R. in *Journal of Economic Biology*, Vol 8, No. 2, pp. 95-98 + 1 fig. London, July 1913.

In January the writer had occasion to examine some apples ("Newton Pippin") received from California by a Dublin fruit merchant. There was no external symptom of disease except for a slight mildewy appearance of the eye, but on cutting them in two, the cores were found to contain aphids which in three cases were alive. There was little damage done to the fruit, beyond a small channel connecting the eye with the core. In one apple the seeds were damaged, but in no case was the flesh injured.

The generation of the species in the *Schizoneura* is carried on chiefly by parthenogenetic females which hibernate on roots or in cracks in the bark during the winter months.

The specimens found in the imported apples were found to be adult females and larvae in different stages of development. This occurrence in the fruits is thus of considerable economic importance, for the importation of such infested apples affords the aphid an opportunity of gaining an entrance and establishing itself in fresh orchards in this country.

Another means of hibernation has been shown by E. M. Patch, who has proved that *S. americana* of the elm and *S. lanigera* of the apple are identical. She claims that the woolly aphis of the apple hibernates in the rough bark of the elm, which is the normal host plant of the sexual brood. Eggs are laid in the elm bark and give rise to virgin "stem mothers", which give birth to a second generation of wingless females. The offspring of these are the third generation, which acquire wings and migrate in the spring.

It is evident that the occurrence of a sexual brood in the apple is uncommon, but there is considerable uncertainty as to the identity of *S. ulmi* and *S. americana*. It would be interesting to know what genetic relationship exists between *S. ulmi* and *S. lanigera*, and if the migration which is known to take place in summer is to the elm or to other apple trees as generally believed.

1125 — **Collembola damaging Pine Trees.** — COLLINGE, W. E. in *Journal of Economic Biology*, Vol. 8, No. 2, p. 99. London, July 1, 1913.

Several species of Collembola have been known to be injurious to various species of roots and flowering plants and to act as carriers of fungus spores.

The writer has recently examined some diseased shoots of *Pinus sylvestris* and found that the damaged buds contained 5 or 6 specimens of a Collembolan which Prof. Carpenter identified as *Seira nigromaculata*.

The insect appears to be attracted by a resinous gum, and as the leaf bud opens, makes its way to the bases of the young leaves, causing the leaves to turn yellow and ultimately fall away. Sometimes the damage is only partial, but mostly the new buds are completely ruined.

As a preventative the scattering of napthaline round the base of the stem, or smearing with a sticky material in the autumn is recommended.

ALFREDO RUGGERI, gerente responsabile.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Present State of Agricultural Education in Austria

by

Prof. ERNST VITAL,

Director of the «Francisco-Josephinum» Agricultural Institute at Mödling.

In Austria, or rather in the countries represented in the Austrian Parliament (Cisleithania), agricultural education is imparted in technical agricultural schools and by travelling lecturers. These two forms of tuition are not sharply distinguished from each other, for often the teaching staff of the schools act as travelling lecturers, while some of the latter hold courses which resemble those given in the schools, differing from them only in being of shorter duration.

A. — TECHNICAL AGRICULTURAL SCHOOLS.

These schools date back to the eighteenth century. The first of them were started on the initiative of private persons, some of whom were large landowners who had recognized the necessity of technical agricultural instruction. With the development of agricultural cooperation, the cooperatives (even some of the smaller ones) founded schools of agriculture. Especially after the sixties, this movement became very active and most of the agricultural schools in Austria owe their origin to private initiative, chiefly that of agricultural associations.

At first some uncertainty prevailed as to the objects and extent of the new schols; only later, in the seventies, did they begin to differentiate according to their several aims. As soon as a Ministry for Agriculture was created in Austria (in 1868) it took an especial interest in agricultural education. After consultation with the most competent persons and institutions the Ministry issued a series of decrees with the object of giving a first organization to agricultural education.

To that period is due the present distinction of higher, medium and lower agricultural schools. This sharp distinction distinguishes the Austrian agricultural school system from that of most countries, in only a very few of which this systematic graduation from the highest to the lowest schools has been adopted.

1. *Higher agricultural education.* — In Austria those institutes which give the highest scientific instruction in all the branches of agriculture, and which admit only those pupils who possess a good general preparation and the leaving certificate (Mittelschulmatura) of medium schools, are considered as agricultural colleges.

The subjects taught are not only the purely technical ones, but comprise also all those scientific subjects which concur in making up a higher culture. The course has a duration of four years and gives the necessary knowledge for managing large estates and for teaching in colleges and medium schools, as well as for scientific research work in agriculture; it also enables students of other professions to gain useful knowledge concerning the cultivation of the soil. At the end of the course there are three State examinations (Staatsprüfungen) to be passed. Besides this the students may obtain the academical degree of doctor in agriculture (Doktor der Bodenkultur) on presenting a thesis and submitting to severe examinations.

At present the following colleges exist in Austria:

1. Vienna (Hochschule für Bodenkultur), consisting of three sections: agriculture, forestry and rural engineering; tuition is imparted in German.

2. Krakau, the agricultural section of the University of Krakau, in which teaching is in Polish.

3. Prague, at the Bohemian University, in which Czech is the language used.

All these three colleges are under the Ministry of Instruction.

Besides these completely equipped colleges there are also agricultural chairs at the following technical colleges: Vienna (German), Graz (German) Prague (German and Bohemian), Brünn (German and Bohemian) and Lemberg (Polish). The object of these chairs is to complete the instruction of the students of the technical colleges, especially of the engineering sections.

2. *Agricultural Academies.* — At first, besides the higher education in agriculture, there were only the medium and lower schools. Towards the end of last century an intermediate school has been introduced between the higher and the medium schools; it is called the agricultural academy and imparts instruction as in the colleges, from which it differs in that the course lasts two years, or if desired three years, instead of four. The academy admits pupils from the medium schools of general culture and also from agricultural medium schools.

There are at the present time three agricultural academies, which are regional institutions, and like all the following agricultural schools are under the control of the Ministry of Agriculture.

While the Colleges do not possess any farm attached to them, or only an experimental one, the agricultural academies have large farms for experimental and educational purposes, and they give their students the theoretical and practical knowledge required for the management of large estates.

3. *Medium Agricultural Education.* — The students who have been through the agricultural medium schools are also capable of managing large and moderate-sized estates, and they can, as well as those from the academies, on conforming to the regulations, become teachers in the lower agricultural schools. These medium agricultural schools are open to all who have passed the lower four classes of a middle school for general culture or all the classes of a secondary school (Bürgerschule).

Instruction in these schools is chiefly theoretical, but where possible practical tuition is also given, as almost all of them dispose of a completely equipped school farm. Students who have obtained their diploma may, upon passing an examination before a commission in the presence of a Government official, be admitted as one-year volunteers in the army.

There are at present in Austria nine medium agricultural schools; in four of these German is spoken, in four Bohemian and in one Polish. With only one exception they are regional institutions. There are, besides, two special schools, one of which is the Klosterneuburg higher school for vine and fruit growing, which is a State institution, and the other the horticultural school at Eisgrub, a private institution, but subventioned by the State and officially recognized.

4. *Elementary Agricultural Education.* — The number of lower agricultural schools is much greater than that of the above-mentioned schools. Their object is the spread of agricultural knowledge among the peasant population. At first there were only elementary agricultural schools for boys. Later such were opened also for girls.

In some schools for boys the course is a two-years one (Ackerbauschule), in others its duration is only of one or two winter half-years (Winterschulen).

The first are the oldest, and they receive pupils who possess the general education that is given in the primary shools (Volksschulen); theoretical and practical instruction (the latter on the school farm) are given. The object of these schools is to form a class of better educated peasants and also overseers and foremen for large estates.

The number of these schools is forty-two, of which thirteen are German, fourteen Bohemian, seven Polish, two Slovenian, two Italian and four bilingual.

The number of agricultural winter schools is constantly increasing, and among the schools for the peasantry they have proved to be the best. As these winter schools are open only during the five or six months of the worst season and as but few of them possess a school farm, the instruction given is mostly theoretical and includes subjects of general education as well as agriculture. The commencement of the courses is regulated according to the climatic conditions of the locality. In most of the winter schools a second winter course follows the first, so that in reality the course covers ten to twelve months.

In general such good results have been obtained with the two-course winter schools that at present the tendency is to found two-course winter schools and to convert into such the one-course schools. For admittance to them the pupils must possess the elementary knowledge given by primary schools. The pupils work during the summer, between the two courses, on their fathers' farms; with the present scarcity of rural labour this is a great advantage. After having frequented these schools they generally remain on their parents' farm, in the improvement of which they use the acquired knowledge, and at the same time set an example to their neighbours.

In 1913 there were 91 winter schools; some are regional, others association or private institutions. There are, besides, some schools which are similarly organized, but which devote themselves to some special branch such as vine-growing or market gardening.

Such special branches are also treated in some lower schools in a one-years' course lasting ten or twelve months or less. Their object is to improve pupils in market gardening, fruit or vine growing, in the cultivation of flax or hops or meadows, and in dairying or other special branches of agriculture; consequently they have been founded where these particular forms of farming are prevalent. Their number is now 24.

5. *Agricultural Instruction for Girls.* — In the nineties the opinion began to gain grouhd that instruction limited only to boys was not sufficient, because in farming in general, and especially in some branches, the influence of the women in the family is very great. Thus the necessity of providing technical instruction for women also was recognized and the first housekeeping schools were founded with the object of teaching farmers' daughters the domestic management of a farm house, together with some notions of agriculture. These schools are not all of them organized on the same lines. There is one housekeeping school which bears the title of agricultural school for girls. In order to be admitted to it a fairly good preparation is demanded, such as is given by the secondary schools (Bürgerschule), training schools for teachers or high schools. Besides housekeeping it teaches agriculture systematically, the curriculum being about the same as in the practical schools of agriculture (Ackerbauschulen), so that the girls on leaving the school are not only qualified to manage a large farm household, but can also act as assistants on a farm or teach in agricultural housekeeping schools.

The other agricultural housekeeping schools, which demand as preparation for admission only the knowledge acquired in the elementary schools, are divided into those whose course extends over a whole year and those in which it is limited to five or six months.

Besides the above, there are also the so-called summer housekeeping schools attached to the agricultural winter schools. They have the same objects in view as the housekeeping schools and a similar curriculum, but they differ chiefly in the shorter duration of instruction (three to five months) as well as in the time of year during which they are open, generally from April 1.

The most important data on the agricultural schools as they were during the scholastic year 1912-13 are the following:

Institutions for Agricultural Education in Austria.

Institutions	State	Regional	District or association	Private	Total	Staff		Number of students	Scholarships	
						Permanent	Assistants		Number	Yearly amount
										£
Colleges and Sections of Universities.	3	—	—	—	3	(1) *92*	(1) *58*	(1) *1 631*	(1) *147*	(1) *2 774*
Academies.	—	3	—	—	3	52	19	342	64	(2) 1 606
Medium schools.	1	8	1	1	11	97	60	1 274	103	1 172
Elementary schools	1	26	13	1	41	169	186	1 486	484	4 530
Agric. winter schools. . . .	—	55	33	3	91	251	610	3 370	921	2 753
Lower special schools . . .	—	19	14	1	34	110	99	868	240	1 794
Agric. housekeeping schools, with 2 years' course . . .	—	—	—	1	1	6	8	22	—	—
Agric. housekeeping schools .	—	4	13	5	22	100	63	630	44	(3) 277
Total . . .	5	115	74	12	206	785	1 045	7 992	1 856	12 132

(1) In the expenses of the colleges those of the forest section and of the rural engineering sections of the Vienna agricultural school are included; for this reason these expenses are not comprised in the total.
(2) Including 12 free places.
(3) In the last budget only two extraordinary grants of £96 are included.

B. — TRAVELLING AGRICULTURAL LECTURESHIPS AND SPECIAL COURSES.

A regular agricultural school education is, under present conditions, available for only a limited number of intending farmers. Consequently it is sought to use other methods besides schools to promote the spread of agricultural instruction. These methods are travelling lectureships and special courses. The lectures are given either by travelling lecturers specially appointed for the purpose or by some of the teachers of agricultural schools, both classes of lecturers visiting in turn the various localities of a district.

While the travelling lecturers in the southern districts, such as Dalmatia and Illyria, which are less developed from an agricultural point of view, are appointed by the State, in all the other parts of the Empire they are officials of the independent local authorities or of the principal agricultural corporations and associations; nevertheless the State contributes in most cases to their salaries.

For all the crown lands, regulations have been drawn up for the carrying out of this service.

As the effect of a lecture is in general but slight, the lecturer is bound by the regulation to keep himself posted in the progress of his territory, to keep in touch with the rural populations and to assist the people with advice and action in any difficulty connected with farming.

Among the duties of the lecturer there is also the holding of courses, which may last a day or more, in order to instruct farmers, anxious to learn, in certain branches of agriculture, such as dairying, live stock keeping, poultry keeping, fruit tree grafting, forage growing, etc. Such courses are often held by teachers of the winter or other agricultural schools during their free time, either in the same schools or elsewhere, and contribute efficiently to the spread of modern farming methods. These courses are not limited to the men and boys only, but extended under the form of lectures on cooking and domestic economy to the women also.

All the members of the teaching staff, whether travelling or otherwise, must before being definitely appointed pass an examination as to aptitude for teaching. This examination is held at one of the colleges in Vienna or in Prague, and is divided into an examination for medium schools and one for lower schools. There are, besides, examinations for fruit and vine growing and for agricultural housekeeping schools. For these examinations there are special regulations drawn up by the Ministries for Education and for Agriculture.

As agricultural instruction in Austria is not all under one single control, but is managed partly by the State and partly by other bodies, such as local governments, district municipalities, associations and even by private persons, it is not easy to ascertain the amounts of the sums spent for this object. Nevertheless, from the following data concerning the expenses and contributions of the State, which form only a small part of the whole, some idea of the outlay may be formed.

The budget for 1913 contains the following figures:

1. In the budget of the Ministry of Instruction, under whose control all the Universities and Colleges are situated, consequently also the agricultural sections of the Vienna College, of the Czech Polytechnic of Prague, and of the University of Krakau, the allotments for agricultural instruction are not given separately, but only the lump sums for each institution. Nevertheless these figures show the amount of the contribution of the State for this branch of education.

In the budget for 1913 the estimates for the Vienna College are set down at £. 28356, of which about one half may be considered as devoted to the agricultural section. There is besides a special credit of £. 1742 provided. Higher agricultural education shares also for an amount which is not stated, in the sums voted for the Czech Polytechnic of Prague, *viz* £. 57078 ordinary expenses, and £. 18892 extraordinary ones, and in those of the Krakau faculty of philosophy, namely £. 31 450 Of these sums between one-fourth and one-third may be safely reckoned as being spent upon agricultural education. It is also to be noted that the cost of the chairs of agriculture at the Polytechnic schools of Vienna, Gratz, Prague, Brünn and Lemberg is also to be included in the sums spent on higher agricultural education.

2. In the budget estimates of the Ministry of Agriculture, upon which all the other schools of agriculture depend, the following figures are included:

1) For the State Institutes of Klosterneuburg, Spalato and Glavica, ordinay expenses	£	10 046
Extraordinary do	»	83
Total . . .	£	10 129
2) For grants to agricultural schools not belonging to the State, as well as for travelling lectureships and special courses, ordinary expenses	£	28 750
Extraordinary do.	»	15 000
Total . . .	£	43 750
3) For the spread of means for agricultural instruction, for scholarships, subventions, travelling expenses, expenses for State inspectors of subventioned schools, for the commissions of examiners of teachers of agriculture and forestry, ordinary expenses . . .	£	8 333
4) For travelling lecturers and special courses, which are partly (in Dalmatia and Illyria) instituted by the State and to a greater extent by the local Governments and by the principal agricultural associations, further for the cost of agricultural instruction to soldiers and for the upkeep of model farms, ordinary expenses	£	15 417
Extraordinary do.	»	4 167
Total . . .	£	19 584

According to the above the total outlay of the State for agricultural education, excepting college education, is:

1) For State Institutions	£	10 129
2) For subsidizing institutions not belonging to the State . . .	»	43 750
3) For general agricultural education.	»	8 333
4) For travelling lectures and special courses	»	19 583
Total . . .	£	81 795

From these figures it may be seen that the State takes a special interest in agricultural education; by comparing them with those of the previous years it will be seen how rapidly the outlay for this object has increased. This increase is explained not only by the increased number of institutions (thus for instance, in 1912, eight new ones have been opened), but also by the greater demands of efficiency made upon them.

Recent Work of the Bacteriological Section of the Central Agricultural Experiment Station at Experimentalfället, near Stockholm

by

CHR. BARTHEL,

Chief of the Section.

The Bacteriological Section undertakes research and experiments on agricultural microbiology in general. This work includes the bacteriology of the soil, of manure and of dairy produce; the subjects are often treated in conjunction with other sections of the Institute.

The work on soil microbiology has been concerned with methods of investigation, and more recently with the influence of organic substances on nitrification and denitrification in the soil. Just now, the decomposition of farmyard manure in the soil, both alone and in presence of lime, is occupying attention. The changes of a biological nature induced in the soil by farmyard manure have so far been insufficiently explained.

In colloboration with the Botanical and Agricultural Sections, numerous trials have been made with different cultures of Leguminous-nodule organisms, such as Bottomley's "Nitrobacterin", Simon's "Azotogen", and cultures prepared by us. "Nitrobacterin" contained no living *B. radicicola,* and consequently produced no effect; "Azotogen" gave very good results and the results of experiments with the cultures prepared in our own laboratory were likewise satisfactory.

On the subject of the fermentation of farmyard manure, work has been undertaken in collaboration with the Agricultural Experiment Section on the possibility of preserving the ammoniacal nitrogen of the manure by the addition to it of whey from cheese-factories. Some years ago I found that the common lactic ferments occurred in great numbers in farmyard manure; by supplying them with carbohydrate material, such as milk sugar, one ought to get a fermentation in which the acids produced fix the ammonia of the manure, thus preventing the usual loss of nitrogen in this form. Chemical and bacteriological analyses, as well as field trials carried out by the Agricultural Section of the Institute, have shown that this treatment of manure (0.25 and 0.5 per cent. of milk sugar being added) has the expected effect, and the manure gives considerable increase of crops over manure kept in the ordinary way.

Bacteriological work on dairy questions has also taken up a good deal of time.

Firstly, a satisfactory method for judging the quality of dairy milk from the hygienic standpoint was sought for. The reductase test was found to answer the requirements in this case. It is very easy to carry out and gives a very fair approximation of the number of micro-organisms present in a milk. The result has been that the method has spread widely, both in Sweden and in other dairy countries. In the Swedish dairies, where the price of milk is now beginning to be fixed on its hygienic qualities, as well as its fat-content, the reductase test is used as the basis for the former.

Other work was dealt with: anaerobic organisms of milk and butter; resistance to heating of tubercle bacilli in whey (in view of a projected measure on compulsory pasteurization of waste dairy products); biology of the lacto-bacilli, especially with regard to the part they play in the ripening of cheeses; influence of different methods of pasteurization on the microflora of milk; bacteria of slimy milk.

These researches are often not confined to the bacteriological laboratory, but are also made in various dairies, so as to bring them under the conditions of practice.

Besides this work, of which the results have been published in the Bulletins of the Central Institute, as well as in various scientific journals in other countries, a great number of bacteriological analyses have been made free of charge on samples of milk, butter, cheese, water used in dairies, soils, etc., sent in by private persons. Consultations on questions of agricultural microbiology are also given free.

Organization of Field Experiments in Denmark

by

H. C. LARSEN,

Secretary of the State Commission for Field Crops at Copenhagen.

Experiments on crops have been carried on in Denmark since the middle of the nineteenth century. When the *Royal Agricultural and Veterinary College* ("Den Kgl. Veterinaer og Landbohøjskole") was founded about that time, 25 acres of the land belonging to it were set apart as an experimental field; on this experiments were begun on a plan similar to that of the Rothamsted Experimental Station. These experiments went on for more than thirty years. From 1882 to 1903, a Commission nominated by our *Royal Agricultural Society* ("Det Kgl. Danske Landhusholdningsselskab") carried on extensive experiments on cereals, particularly wheat and barley; these were made in various parts of the country and were aimed at determining: the varieties best suited to the climatic conditions of the country, best date for sowing, amount of seed, time of harvest, method of harvesting, etc. In 1894 *Local Agricultural Societies* began experiments on the land of their members, practical farmers; this work has extended so much that each year more than 2000 experiments are made, under the auspices of about 120 societies in all parts of the country. The results of these experiments are generally only of local value, and indeed are often only applicable to the field in question; in the earlier years they were mostly concerned with the use of chemical manures and the manurial requirements of the soils; later they were extended to almost all points of field practice. By statistical elaboration of the mass of material for each year's experiments, the results have been made useful in various branches of agriculture in a way that was not previously possible.

The *Government crop experiments* ("Statens Forsøgsvirksomhed i Plantekultur") were begun after 1870 by P. NIELSEN, State consulting specialist, under the auspices of our Royal Agricultural Society. They are essentially based on *fixed field experiments*, whose results, separately or combined, can be considered of value for the whole country, or at any rate for large areas. This branch was made into an independent State institution in 1886 by the establishment of an experimetal station at Tystofte.

The following *permanent Government crop experiment stations* now exist:

1. *Tylstrup*, in northern Jutland (Vendsyssel); established in 1894; area — 91 acres of sandy soil, 91 acres of fen (*Carex* moor), 128 acres of peatmoor (*Sphagnum* moor).
2. *Studsgaard*, in central Jutland; established in 1906; area — 111 acres of light sandy soil ("grass heath"), 37 acres of sandy soil at *Borris* (western Jutland), 27 acres of fen, 54 acres of peatmoor near *Herning*.
3. *Askov*, in southern Jutland; established in 1886; area — 57 acres of clay, 17 acres of sandy soil, 15 acres of peatmoor.
4. *Aarslev*, in Fünen; established in 1905; area — 82 acres of clay.
5. *Lyngby*, in north-east Zealand; established in 1890; area — 128 acres of clay.
6. *Tystofte*, in south-west Zealand; established in 1886; area — 74 acres of clay.

The *sub-stations* are as follows: *Abed*, in Laaland (5 acres of good clay), and *Aakirkeby*, in the island of Bornholm (7 ½ acres of heavy clay).

Temporary experiments, made on a fairly large scale, comprise: growing of root crops, diseases of plants and their control.

With these experiments are combined chemical, botanical and bacteriological researches, carried out in the *State Field-crop Laboratory* ("Statens Planteavlslaboratorium") at Copenhagen, as well as in the *chemical laboratories* of the permanent stations.

The *Danish Seed Control* ("Statsanstalten Frøkontrol") was established by the State in 1871; this institution assists in the experiment work by controlling the seed used in the trials.

In the *State experiments*, the method to be followed is fixed especially with regard to the *position of the stations* and the nature of their land. As mentioned above, three of the six permanent stations are in Jutland and three in the large islands, while the smaller islands have two sub-stations. The country is thus divided into naturally bounded districts, in which the soil and climate are in agreement with those of the station; in each district the land for the experiments has been chosen to have soils as typical as possible for the regions under consideration (clay or sand, fen or moor).

As the results of the experiments carried out at each station depend essentially on the soil and climate, this method guarantees them the greatest possible value for the agriculture of the district; and as they are, owing to their nature, carried out simultaneously at several or all of the stations, the conclusions drawn from them rest on as wide and solid a base as possible. This is particularly important in comparative trials with different varieties of crops and in experiments on seed yield, time and method of sowing, cultivation, rotations, etc.

Before a piece of land is selected for experiments, the conditions and evenness of the soil are very carefully gone into; uniformity is an indispensable condition of land for experiments. Numerous samples of soil and subsoil are taken according to a pre-arranged plan and at definite distances apart; these are judged and submitted to physical and chemical examination. When the experimental ground has been chosen, the whole is given a trial cultivation by the same methods and under the same crop, generally for several years, so as to work out any possible irregularities due to previous cropping; the soil is thus made uniform. At the same time, the uniformity is tested by weighing the produce of plots not larger than those which will eventually be laid down. The large amount of material obtained from these preliminary investigations allows a very exact estimation of the evenness of the land to be obtained, and serves for the arrangement of the experiments, the classification of the soils, and the setting-out of the fields and plots for the different experiments. The management of the plots is also arranged so that any differences due to the experiments themselves are equalized before fresh experiments are started.

In Denmark, as elsewhere, the disturbing influence of variations in fertility is further guarded against by arranging a large number of parallel plots, arranged in size, shape and position in such a way that their average fertility may be supposed to be the same as that of the whole field. The number of parallel plots is generally from 6 to 12; for manuring experiments they cover 4 to 2 rods ($^1/_{40}$ to $^1/_{80}$ acre); for trials of various seeds and crops, 2 rods to 12 sq. yds. ($^1/_{80}$ to $^1/_{400}$ acre); for pasture plants, 1 rod to 6 sq. yds. ($^1/_{160}$ to $^1/_{800}$ acre). The smaller the resulting figures from an experiment, and the less the evenness of the land, the greater must be the number of parallel plots. With variety-trials the number often reaches 16, and sometimes exceeds 20 (1). The influence of two adjacent plots on one another may be avoided by establishing a sort of protecting belt all round the plot, and weighing only the produce from the part thus enclosed.

The exactness of working may be examined and checked by a calculation of the probable error on the materials used, and this can be made as well while the experiments are in progress as when it comes to working up the results for publication. But nothing is published till the results admit of no possible doubt. The experiments are carried on for at least five years, and often for a much longer period before the results are considered fit for publication. Experiments on manuring for rotations thus last over two or three courses, making 16 to 24 years. In this way the influence of the different seasons is largely eliminated, in most cases a necessary condition for obtaining reliable results.

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(1) In working with different varieties of cereals, the seed samples are all taken from the same spot and under similar conditions. In root crops, especially in comparing varieties, the percentage of dry matter is considered as of prime importance; to determine this four average samples are taken from each parallel plot for each variety, each sample consisting of at least fifty roots; all these roots are cut across four or five times to get a pulp for analysis. The dry matter is calculated from the mean of the four analyses.

The organization and direction of the State activity as regards experiments is under the control of the Ministry of Agriculture. The *permanent Experiment Stations* are organized as ordinary farms as far as the experimental work permits. Each station is under a *director of experiments*; further, two such directors have charge of the temporary experiments. The directors engage the staff and are nominated and dismissed by the Minister of Agriculture on the advice of the *State Commission for Field Crops* ("Statens Planteavlsudvalg"). This Commission acts as intermediary betweenn the Minister and the State activity on field crops; it sits at Copenhagen and is composed of three members nominated respectively (subject to the approval of the Minister) by the Royal Agricultural Society (whose delegate acts as Chairman), by the governors of the Royal Agricultural and Veterinary College and by the Agricultural Societies which cooperate in the work.

The Budget fixes every year a detailed *plan of work* for the State experimental activity, with details for carrying out the experiments and researches proposed; these number over 200 each year. The directors of experiments discuss the experiments to be made with the representatives of the local experimental organization and also with those of other institutions which collaborate in the work; they then together make up a plan of work, which is sanctioned by the State Commission after joint discussion and possible revision; after this the directors are solely responsible for carrying them out. A copy of the results is sent in each year to the archives of the Commission and is used for the working out of the results. The directors themselves undertake this work; for each series of experiments a *reporter* is nominated; when the series is finished he balances the results and draws up his report. This report is agreed to by all the directors and then published by the State Commission in the *Annals of the Production of Field Crops*; this is the organ of the experimental activity, and is edited by the secretary of the State Commission. *Summarized popular reports,* drawn up in the same way, are published as special leaflets and in the newspapers, to bring the results of the experiments before farmers; they are distributed free in large numbers in railway stations and agricultural schools, and at meetings, shows, etc. These summaries are also published in the *Annals*.

which also give reports and extracts of reports on the local experimental work, control of Danish seeds, etc. (1).

The *organization and direction of the local experimental activity* is undertaken by the local Agricultural Societies or their federations. The plans are elaborated and directed by *Local Crop Commissions* and are carried out by the consulting specialists named by them, or at any rate with the assistance of these. The different Local Commissions in each Province work together, holding a joint meeting once a year; at this meeting a complete report on the results of the experiments made in the province is presented, and the problems and plans for the experiments of the coming year are discussed. The four Provinces of Jutland, Fünen, Zealand and Laaland-Falster, each have also a Crop Commission nominated by the societies cooperating in the work, with a consulting specialist for the subject. These *Provincial Crop Commissions* direct the joint work of the Local Commissions, collect and publish their reports, and through their consulting specialists organize and direct the experiments and researches of special interest for the province or the country in general. In the case of experiments of general interest the matter is discussed at the annual meetings of the Provincial Commissions and between these and the State Crop Commission, the State directors of experiments, etc.

The *annual State grants* are as follows: for the State experimental activity, about 200 000 crowns (£11 000); for the local experimental activity, about 100 000 crowns (£5 500). The latter is allotted on condition that the Societies themselves contribute more than one-half of the total expenses of the experiments.

The Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite, Leucite, etc.

by

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CONSUMPTION AND EXPORTATION OF STASSFURT POTASH SALTS.

Before examining the question of the possibility of replacing the Stassfurt potash salts by other minerals it is necessary to know what quantities of these salts are produced and consumed.

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(1) Subscriptions for the *Annals* may be sent to the "Gyldendalske Boghandel", Copenhagen; the price for one volume (yearly) is 6 crowns (6s 7d).

The total production of potash salts (crude) in Germany was (1):

In 1910	8 031 838	tons
In 1911	9 553 144	"

The manufacture of concentrated salts from the crude material during the same years and in the same country was as follows (2):

Year	Chloride of potash	Sulphate of potash	Sulph. of potash and magnesia calcinated 48 %	Potash salts for manure	Sulph. of potash and magnesia 40 %	Kieserit in blocks	Calcinated ground kieserit
	tons	tons	tons	tons	tons	tons	tons
1910	427 382	91 735	40 873	516 581	105	29 382	742
1911	436 352	108 383	48 239	635 522	141	29 700	704

The quantities used in Germany for agricultural purposes were the following (2):

Year	Crude salts	Containing pure potash	Manufactured products	Containing pure potash	Total	
					Salts	Potash
	tons	tons	tons	tons	tons	tons
1910	1 923 623	249 646	261 176	104 012	2 184 800	353 658
1911	2 168 335	285 294	324 739	130 374	2 493 074	415 669

The quantities of crude salts exported amounted to (2):

In 1910	1.16	million tons
In 1911	1.13	" "

The greatest quantity (709 600 tons in 1910 and 631 900 tons in 1911) was exported to the United States. Next in importance are the Netherlands with 140 700 tons, followed by Russia with 67 000 tons.

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(1) According to Dr. M. HOFFMANN: *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, 1910, Part 216.

(2) According to Dr. Hoffmann: *loc. cit.*

The quantities of chloride of potash exported were (1):

In 1910	266 000	tons
In 1911	325 000	"

The chief importing countries were:

	In 1910	In 1911
United States	177 000	219 500
France	34 400	39 100
England	14 600	13 900
Spain	8 600	11 700

The exports of sulphate of potash were (2):

In 1910	74 800	tons
In 1911	108 000	"

The following quantities were shipped:

	In 1910 — tons	In 1911 — tons
To the United States	39 070	56 100
" France	8 560	14 860
" Spain	3 250	5 610
" Ceylon	2 230	3 710
" Japan	414	1 480
" Algiers	1 052	1 820

The amounts of sulphate of potash and magnesia exported in 1911 were (2) 278 500 tons, of which 140 700 tons went to North America, 44100 tons to the Netherlands and 31 500 tons to Sweden.

The table on the next page shows the quantities of potash consumed in the whole world (3):

From the above statistics it will be seen that very considerable quantities of Stassfurt salts are used and that their consumption is on the increase.

Besides the so-called Stassfurt salts which contain potash in a soluble form (KCl or K_2SO_4) and which hitherto have been found and worked in large quantities only in Germany, other minerals containing potash are met with in considerable masses in other parts of the globe. Such are various silicates containing potash: phonolite, leucite, sanidine, muskovite, orthoclase, etc. For a long time past attempts have been made to use these minerals as manures.

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(1) According to Dr. GROSSMANN. Die Ernährung der Pflanze. — *Illustr. Halbmonatsschrif* Year VIII (1912), No. 6.

(2) According to Grossmann, *loc. cit.*

(3) According to Dr. Hoffmann, *loc. cit.*

Country	Total potash in tons	Consumption in lbs. per acre
1. Germany	353 835	9.123
2. United States	241 351	1.301
3. Belgium	8 845	4.241
4. Holland	28 934	12.898
5. France	22 482	0.619
6. England	9 778	1.291
7. Scotland	5 804	3.561
8. Ireland	2 754	1.157
9. Austria	11 628	0.735
10. Hungary	1 321	0.068
11. Switzerland	2 733	1.105
12. Italy	5 512	0.308
13. Russia	14 318	0.100
14. Spain	7 232	0.297
15. Portugal	778	0.154
16. Sweden	16 364	4.240
17. Norway	1 733	2.741
18. Denmark	4 298	1.524
19. Finland	966	0.783
20. Other countries	14 282	—

VALUE OF PHONOLITE AS MANURE.

Of late especially, efforts have been directed towards the introduction of phonolite into agricultural use, for it was believed that it could compete with the so-called Stassfurt salts; as quite recently many experiments have been conducted to ascertain the foundation for the above belief it is now possible to give an opinion based on facts as to the real value of this mineral. Phonolite is a leucitophyre and consists chiefly of nosean, sanidine, nepheline, leucite, augite and biotite. It contains an average of 9 to 10 per cent. of total potassium (of which 33 per cent. is soluble in hydrochloric acid, while only traces are soluble in water), 6 to 8 per cent. of sodium, 2 to 3 per cent. of lime and magnesia, 25 per cent. of oxide of iron and alumina and 50 per cent. of silica.

When phonolite meal was placed on the market, a number of papers were published, especially by **Wein**, with the object of demonstrating the good effects of phonolite. As the cause of their useful action, said to be equal to that of the Stassfurt salts, the easy weathering of the stone was mentioned as rendering potash available in sufficient quantities.

But many control experiments carried out by impartial workers have failed to confirm these favourable results.

When **Pfeiffer** and his collaborators (1) compared the effects of phonolite with those of sulphate of potash by means of pot experiments in sandy soil, they obtained the following results. The figures refer to the excess of crop over the pots left without potash manures.

				ratio
By 1 gm. of K_2O as	K_2SO_4 :	29.49 gms. of oats	± 2.49	100
» 1.087 » »	phonolite :	11.82 » » »	± 2.81	40
» 2 » »	K_2SO_4 :	40.33 » » »	± 2.84	100
» 2.174 » »	phonolite :	19.75 » » »	± 2.29	49

According to the above the utilization of the potash contained in phonolite was much inferior to that in the sulphate of potash, being as 9.7 to 88.2. Similar results had been already obtained by other experimenters.

Thus **Wagner** (2), in pot experiments comparing sulphate of potash and phonolite for rye-grass, found the following quantities of excess crop over the controls without potash :

		On sandy soil	ratio	On peaty soil	ratio
By 2.5 gm K_2O as	K_2SO_4 :	21.9 gm.	100	73.2	100
» 2.5 » »	phonolite:	10.1 »	46	24.1	33
» 3 » »	K_2SO_4 :	29.3 »	100	85.6	100
» 3 » »	phonolite:	8.5 »	29	39.2	46

The utilization of potash was as 100 : 11 on sandy soil and as 100 : 14 on peaty soil.

Schneidewind (3) also found throughout a considerably smaller effect of phonolite in comparison with chloride of potash. The ratio of the effects of equal quantities of potash given under the forms of chloride of potash and of phonolite were as follows :

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(1) **Pfeiffer, Blanck** and **Flügel** : Die Bedeutung des Phonoliths als Düngemittel. *Mitt. des Landes Instit. Breslau*, Vol. VI, Part 2, 1911.

(2) *Deutsche Landw. Presse*, p. 1, 1909.

(3) Versuche über die Wirkung des Kainits 40%iger Kalisalze und Phonolite. — *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, 1911, Part 193.

	Chloride of potash	Phonolite
Potatoes	100	33.9
Spring wheat	100	34
Mixed clover and grasses	100	20.3

The utilization of the potash contained in the two manures was the following :

	Chloride of potash	Phonolite
Potatoes	100	24.7
Spring wheat	100	4.1
Mixed clover and grasses	100	10.8

Experiments on vegetation carried out by **Heinrich** and **Honcamp** (1) showed that the effects of equal quantities of potash under the form of 40 per cent. potash salts and of phonolite were respectively as follows :

		40 % salt	Phonolite
Barley	(grain)	100	36
»	(straw)	100	36
Peas	(grain)	100	31
»	(straw)	100	42

The utilization of the potash in the phonolite was with barley 14 per cent. and with peas 20 per cent. of that of the 40 per cent. potash salt. All these careful experiments show that the potash contained in phonolite has undoubtedly a certain action, but that this is notably inferior to that exerted by easily soluble potash salts.

The results obtained by the easily soluble potash salts, contrary to the statements of interested parties, are not attained when phonolite is not mixed with the soil but given as a top dressing, as, for instance, was done in Pfeiffer's experiments. As for the other available trustworthy experiments they do not offer data differing to any extent from the preceding ones.

In the open field phonolite does not in any way have the same effects as the Stassfurt salts. This is clearly shown by the experiments made by Schneidewind (*Arbeiten der Deutschen Landwirtschafts-Gesellschaft,* 1911, Part 193), Tacke (*Protokoll der* 64 *Sitzung der Zentralmoorkommission* 1910, and *Illustr. Landw. Zeitung* 1910, No. 3), v. Feilitzen (*Mitt. der Deutschen Landw. Gesellschaft,* 1910, page 145), Hiltner and Lang (*Prakt. Blätter f. Pflanzenbau,* 1909, Parts 10 and 11), Popp (*Mitt. der Deutschen Landw. Ges.,* 1909, p. 724), etc. Thus for instance Hiltner and Lang determined that the effect of equal quantities of potash given to oats under the form of 40 per cent. potash salts and of phonolite stood in the ratio of 100 : 22 to 60 (according to the other fertilizers applied at the same time); when given to potatoes the ratio was 100 : 8 to 30 (according to the other fertilizers used at the same time).

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(1) Vergleichende Untersuchungen über die Düngerwirkung von 40 %igem Kalisalz Kalisilicat, etc. — *Mitt. der Deutschen Landw. Ges,* 1910, No. 45.

Popp found that in an average of three years the effect of Stassfurt salts stood to those of phonolite as 100 : 26 to 31, and in another experiment lasting four years as 100 : 26 to 28.

It was thus demonstrated that in the open field, as in pots, the utilization of potash when given as phonolite was considerably less than when given as Stassfurt salts.

TACKE's field experiments showed that potatoes on sandy soil utilized 26.9 per cent. of the potash of 40 per cent. potash salts, and only 1.2 per cent. of that of phonolite (ratio 100 : 4.5); he showed further that with moor oats on moor soil the ratio of utilization was as 100 : 22 and that with potatoes on moor soil it was as 100 : 24.

In some isolated cases (observed by Popp) the effect of the potash in phonolite was found to be equal, and even superior. to that of the potash in Stassfurt salts. But these results, as well as their opposite in which phonolite either exerted no action at all or was positively injurious, have no significance; they are in the most favourable cases quite exceptional and most probably due to chance caused by the imperfection of field manuring experiments.

The conclusion drawn from both pot and field experiments, namely that phonolite has a certain action but that this is inferior to that of Stassfurt salts, agrees with its petrographic mineralogical composition. One of the chief components of phonolite, and at the same time the richest in potash, is sanidine, which is decomposed with difficulty: the potash of this mineral is not attacked by hot concentrated hydrochloric acid. Nosean and nepheline are more easily decomposed, but they are poor in potash and rich in soda. Leucite is more easily decomposed, and weathered than sanidine; thus the potash available for plants would appear to derive from leucite and nepheline, while the chief potash-bearing mineral, that is sanidine, is hardly to be considered as a source of potash for vegetation.

From this composition of phonolite it can be further concluded that the easy weathering attributed to it is due to the minerals nosean and nepheline, which, however, contain but small quantities of potash. The easy weathering of phonolite, upon which so much stress is laid, can only to a very limited extent cause a rapid action of potash.

VALUE OF FELDSPAR AS MANURE.

For a long time past feldspar has been considered as a possible manure. Thus W. KNOP in his treatise of agricultural chemistry (1868) at page 188 said that it was not unlikely that some day feldspar would be used as a fertilizer. It was also believed that its potash was easily assimilable by plants; but experiments carried out with this mineral have shown that the manurial effect of the potash-containing feldspars is very slight (1), as the following experiments prove.

Heinrich and Honcamp (see foot-note) found that the fertilizing effects of equal quantities of potash given under the forms of 40 per cent. potash salts, of phonolite and of feldspar were as in the following table, in which the quantities produced above those of the control plot are given:

	Straw	Ratio	Grain	Ratio
1. *Barley.*				
40 per cent. potash salt	348.2	100	343.8	100
Phonolite	136.2	39	124.8	36
Feldspar	60.2	17	25.2	7
2. *Field peas.*				
40 per cent. potash salt	204.7	100	94.3	100
Phonolite	85.9	42	29.2	31
Feldspar	27.1	13	10.3	11

As for the utilization of potash, if that, of the 40 per cent. salt be made equal to 100, then the utilization of phonolite by barley was = 14 and by field peas = 20; while the utilization of feldspar by barley was = 4 and by field peas = 7.

This inferior effect of feldspar (orthoclase) compared with that of phonolite (leucitophyre) is in harmony with the lower solubility of the potash of orthoclase in water containing carbonic acid and in ammonium chloride solution as compared with that of the leucitophyre potash; this as has been determined by R. Müller, K. Glinka, H. Stremme (2) and others. A series of experiments made under Prianishnikov's direction show that all the minerals of the feldspar group possess only a very low potash effect, as may be seen from the following figures:

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(1) Manuring experiments with feldspar have been conducted, among others, by:

C. v. Feilitzen: *Svenske Moorkultur Förenings Tidskrift*, 1891 (quoted by Blanck, *Zeitschrift d. Landw. Kammer f. Schlesien*, 1913).

L. F. Nilsons: *Landtbruks Akademiens Handlingar och Tidskrift*, for 1889 (quoted by Blanck, *loc. cit.*).

J. Sebelien: *Tidskrift för det Norske Landbrug* XIII, 1901, p. 69 (quoted by Blanck, *loc. cit.*).

D. Prianishnikov: *Landw. Versuchsstation*, Vol. 63, 1906, p. 151; Vol. 77, 1912, p. 399.

R. Heinrich and F. Honcamp: *Mitteilungen der Deutschen Landw. Ges.*, 1901 Parts, 4 and 5.

(2) H. Stremme,: Die Verwendung des Leucitophyrs als Kalisilikat. — *Kali, Zeitschrift für Gewinnung der Kalisalze*, 1912, Part 7.

	Without potash	With orthoclase	With microkline	With sanidine	With KCl (normal culture)
Oats	5.33	4.56	5.61	4.66	22.96
Buckwheat	1.50	2.40	1.95	1.88	14.95
Vetches	2.05	2.45	2.65	4.65	13.85

Thus the potash feldspars (orthoclase, sanidine, microkline are the feldspars richest in potash) can compete with the easily soluble Stassfurt salts still less than the leucitophyres (phonolite).

VALUE OF FELDSPAR-LIKE MINERALS (LEUCITE, NEPHELINE) AS MANURES.

It is well known that leucite (silicate of potash and alumina) is relatively easily weathered. Owing to the circumstance that leucitic rocks are found in considerable quantities in Italy, the question of using leucite for manurial purposes has been investigated for some years past in that country (1). **MONACO** (2) has used for this purpose the fairly decomposed rock, containing leucite, of Orchi on the volcano of Roccamonfina, ; he examined its solubility in various substances but did not obtain any very favourable results.

The manurial experiments directed by **PRIANISHNIKOV** (3) with leucite have confirmed the above results and shown the not very satisfactory effect of leucite as a source of potash, as may be seen from the following figures:

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(1) It may here be mentioned that in Italy leucitic basalt has been worked for leucite by separating the non-magnetic minerals, leucite and potash-mica (feldspar) from the magnetic silicates of iron and the basaltic magma, by means of magnets. The non-magnetic product contains an average of 30 per cent of leucite. The cost of preparation is about 17 shillings per ton (cf. LANGGUTH, Leucit ein Rohstoff für Kali- und Aluminiumdarstellung: (*Zeitschrift für prakt. Geologie*, 1905, p. 80, quoted by Stremme, *loc. cit.*). Recently in Italy this method of obtaining leucite is again raising interest.

(2) E. MONACO: Sull'impiego delle roccie leucitiche nella concimazione. *Le stazioni sperimentali agrarie italiane*, Part 7, pp. 577-583 (Modena, 1903). Cf. Stremme, *loc. cit.*

(3) PRIANISHNIKOV: *Landw. Versuchsstation.*, Vols. 63 and 77.

Crop	Without potash	With leucite	With KCl
Millet I.	3.12	3.25	29.24
Oats	4.78	4.81	12.15
Wheat	2.75	4.05	6.40
Millet II.	4.5	8.27	48.68

According to Prianishnikov, nepheline gave better results than leucite. As on the shores of the White Sea there are great masses of this mineral, which, provided there were cheap means of transport, could perhaps be used in agriculture, **Prianishnikov**, at M. Fedorov's recommendation, caused experiments to be made with this mineral. The following results were obtained:

Crop	Without potash	With nepheline	With KCl
Buckwheat	1.70	17.60	17.60
Millet	3.70	23.50	34.95

According to these experiments and others made by Prianishnikov's pupils, some of which, however, have to be accepted with some reserve, it appears that nepheline is capable of yielding good results as a source of potash. Further experiments on the action of leucite and of nepheline are desirable to clear up the question finally.

According to Prianishnikov's data the chief mass of the nepheline mineral consists of nepheline, biotite and apatite; further experiments of Prianishnikov may show that the good effects of nepheline mineral are not due principally to its content of nepheline (elaeolite) but to the biotite it contains.

Value of Micas as Manures.

Both potash mica (muscovite) and magnesia mica (biotite) have a relatively high potash content.

The researches of **Prianishnikov** (1), **Bieler-Chatelan** (2), **J. Samojloff** (3), **E. Blanck** (4) tend to show, contrary to the generally received opinion, that the potash contained in mica is more available to plants than that contained in feldspar.

According to Prianishnikov's experiments the effects of potash mica compared with those of potash feldspar were the following:

Potash fertilizer	Crop of barley	Potash fertilizer	Crop of oats
Control without potash . . .	1.66	Control without potash . .	1.65
Mica, simple dressing	3.93	Orthoclase	—
» double »	6.37	. . . .	—
» four-fold »	10.27	» four-fold dressing	2.25
. . . .	—	» six-fold »	3.50
» eight-fold	15.10	» eight-fold »	3.62
Chloride of potash, simple dressing	22.17	Chloride of potash, simple dressing	15.10

Blanck observed that magnesia mica or biotite, the potash content of which ranges from 3 to 11 per cent., is superior as a potash manure to potash mica or muscovite, which contains 8 to 10 per cent. of potash.

The above are the chief rocks and minerals which might eventually be used as potassic fertilizers. The researches mentioned in the preceding pages prove that, as far as present observations reach, their manurial effect is considerably inferior to that of the so-called Stassfurt salts and that at present at least they cannot be discussed as substitutes for the latter. At most some of them may eventually acquire local importance.

The nepheline examined by Prianishnikov seems perhaps to be more effective than the other silicates of potash, but its potash content is only 3.88 per cent. Prianishnikov arranges the various minerals according to order of merit as potash manures as follows: nepheline, mica-schist, biotite, philipsite and muscovite, elaeolite, leucite, apophyllite, sanidine, orthoclase, microcline.

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(1) **Prianishnikov**: *loc. cit.*

(2) **Bieler-Chatelan**: *Compt. Rend.*, 1910, Vol. 150, p. 1152 (quoted by Blanck, *loc. cit.*).

(3) J. **Samojloff**: *Zentralbl. f. Mineral* etc., 1910, p. 261 (quoted by Blanck, *loc. cit.*).

(4) E. **Blanck**: *Journal für Landwirtschaft*, 1912, p. 97.

The Present State of Olive Growing in Italy

by

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From the most remote antiquity the cultivation of the olive has been very important in Italy.

The special conformation of the country, its position in the basin of the Mediterranean, that is in the centre of the habitat of the olive, the mildness of its climate and the fertility of its soil, render the peninsula very favourable to the growth and productioness of this oil plant. It is not certain whether Italy or Spain occupies the first place for extent of area under olives and for quantity of oil produced. Whilst the sources of Spanish statistics are liable to discussion, in Italy at present a different system is followed in the valuation of the area under olives, a distinction being made between the area devoted exclusively to olive trees and that which these trees share with other crops. Thus comparison between the two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system give the following figures for the acreage under olives:

	acres
Average between 1870 and 1874	2 210 650
» » 1879 » 1883	2 294 630
» » 1890 » 1895	2 663 538
» » 1901 » 1908	2 705 428

With the new system the figures are:

Average between 1909 and 1912	acres
Olive trees intermigled with other crops	4 358 562
Olive trees alone	2 353 560

Considering the figures according to the new sytstem to be correct, it appears that the area estimated at 2 705 428 acres was in reality 3 423 420 acres.

Though we may not infer that the area occupied by the olive has risen from 2 210 650 acres in 1870 to the present 3 423 420 acres, as the latter figure may be, and probably is, due to greater accuracy or at any rate to a different method of estimating the area, there are in reality grounds for believing that the area under olive trees has sensibly gained in extent, as a fair number of new plantations are to be seen, mostly better set out than the older ones. There was, however, a short period after 1880 during which many olive groves were destroyed to make way for vineyards; this took place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the present time.

Taking into consideration large averages we get, up to 1908, that is up to the new statistics, the following figures for olive oil:

					gallons
Period between		1870	and	1883	73 843 000
»	»	1885	»	1896	53 663 500
»	»	1897	»	1908	45 988 800

According to recent statistics the average from 1909 to 1912 was 40 282 000 gals.; but perhaps 50 025 800 gals. would be nearer the mark, as it would include the residual oil (including "olio lavato", extracted from the pomace by washing; "olio d'inferno", collected from the well under the presses; and that obtained by treatment with carbon disulphide). (1). For comparison, with the returns of the older statistics the figure of 43 956 000 gals. should be taken, as it includes only the "inferno" oil. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of this crop during the last thirty years are many and of various kinds, namely: weather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889; it appears that during these 25 years *drought* and *scirocco* caused more or less injury in 21 cases; *winter frosts* and *cold springs*, and *mists* and *rain* that injured the flowering, in 7 cases; the *olive fly* caused serious and general injury in 10 cases; lesser or partial damage, together with *Rhynchites* and *Phlaeothrips* and other insects in 7 cases; *Cycloconium* caused partial injury from the year 1902 onwards and since 1910 with increasing gravity and in almost all the growing districts. From the above it is seen that the most efficient cause of injury is the almost constant *drought*, which is easy to understand if one remembers that the olive tree grows mostly on hills and mountain slopes and most frequently without the necessary work being done to retain the rainwater, while the olive tree requires a good deal of moisture, which, as Giglioli (1) says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the *olive fly* and other animal or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees which we shall briefly consider.

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(1) Whilst in the old statistics the quantity of oil was ascertained directly from that obtained during the season in each commune, with the new system the quantity of olives is recorded and the quantity of oil is calculated according to the average yield in the mill in the various districts. This yield does not include the "inferno" oil, nor that obtained by washing or treating with carbon disulphide, though these oils also are put upon the market; the first of these oils is used to a great extent as food by the poor, who often prefer it to the better oils; it is also used, as well as that obtained by washing and by treatment with disulphide, in the industries. The "inferno" oil may be calculated at about 1.5 per cent. and the other two oils at 2.5 per cent. of the crushed olives.

In the first place let us examine how the olive is cultivated in the various regions of Italy (2) (see Table 1).

TABLE I.

Region	Intermingled culture acres	Specialized Culture acres	Total — acres
Piedmont	—	—	—
Liguria	62 738	88 426	151 164
Lombardy	9 139	3 705	12 844
Venetia	2 717	4 693	7 410
Emilia	16 549	—	16 549
Tuscany	685 919	26 182	712 101
Marches	425 581	—	425 581
Umbria	141 778	17 043	158 821
Latium	126 711	40 508	167 219
Abruzzi and Molise	657 514	4 940	662 454
Campania	446 082	106 210	552 292
Apulia	545 376	712 101	1 257 477
Basilicata	42 484	40 014	82 498
Calabria	491 530	141 284	632 814
Sicily	696 787	117 078	813 865
Sardinia	7 657	51 376	59 033
Total	4 358 562	1 353 560	5 712 122

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(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: Di alcune condizioni che influiscono sull'efficacia dei concimi chimici. Rome, 1903.

(2) MINISTERO DI AGRICULTURA, INDUSTRIA E COMMERCIO. — UFFICIO STATISTICA AGRARIA. Prospetti riassuntivi dei XX prodotti rilevati nel quadriennio 1909-1912. Part 12, June 1913.

As the above table shows the olive tree is grown in all the regions of Italy save in Piedmont, but two thirds of the olive groves are in the south of the peninsula, the provinces of Apulia, Sicily and Calabria occupying in this respect the foremost positions.

Fully three-quarters of the olive groves are under intermingled crops, that is they contain besides olive trees other plants, most frequently cereals (wheat and maize) which are grown up to the very trunks of the trees; most of the groves consist of old irregularly arranged trees, often in rows running straight down hill on very steep soils, or without sufficient protection against the surface water which lays their roots bare. In those groves mostly (the older ones) formed exclusively of olive trees, they are often too close together so that the crowns in their struggle for light and air grow to a great height; as much as 33 to 48 feet; this may be seen in Calabria, in Liguria and in some parts of Tuscany.

The number of different varieties scattered at random in the groves is considerable; there is also much confusion in their names; nevertheless the number of the prevailing varieties grown for oil in each region is relatively limited. The following may be noted as being the most frequently met with and the richest in oil:

In Liguria: *Taggiasco*.

In Tuscany: *Razzo* or *Frantoiano*, *Moraiolo* or *Morinello*, and *Leccino*.

In Umbria and the Marches: *Raio* or *Razzo*, *Moraiolo*, and *Carbonella*.

In Latium: *Carbognola* or *Marsella*, and *Verniera*.

In the Abruzzi: *Nordana*, *Gentile* and *Olivone*.

In Apulia: *Paesana* or *Baresana*, *Coratina*, *Monopolese*, and *Ogliarola*.

In Calabria: *Ottobrarica*, *Coccitanica*, *Mammolese*, *Nicastrese*, *Cumignana*, and *Roggianese*.

In Terra di Lavoro and Molise: *Aurina* and *Caiazzana*.

In Lombardy and Venetia: *Casaliva* or *Nostrana*, and *Drop* or *Tombolet*.

In Sicily: *Ogliaia*, *Calamignara*, and *Cerasola*.

In Sardinia: *Maiorchina* and *Genovese*.

In general, among the above-mentioned varieties that give the most valued fruit, there are others called *Olivastri*, *Olivastroni* or *Olivastrelli*, because they are hardier, more resistant and more constant in bearing fruit than the preceding varieties, but their fruit does not contain so much oil nor is it as delicate. These latter varieties deserve greater consideration in view of the exhaustion and low productiveness of the other varieties due to their having been multiplied a vegetatively during centuries and to their lack of resistance to unfavourable conditions.

In fact for centuries the olive trees have been multiplied by means of *ovoli* or *puppole*, as the egg-shaped buds which are formed at the base of the stem are called in Tuscany, Umbria, Latium and Reggio Calabria, in which regions this method of multiplication is used. In the Marches, Apulia, Abruzzi, Catanzaro, Cosenza and Sicily cuttings (*talee*) are used, and in Liguria, Lombardy, Venetia, Latium and some parts of Sicily the shoots that grow at the foot of the tree (polloni) are preferred. Less frequent is the use of wild olive trees, as in the districts of Lecce, Capitanata

Grosseto and Sardinia, and still more rarely recourse is had to plants obtained by sowing the olive stones. The result of the above vegetative methods has been to perpetuate the defects of the mother plants, such as canker, and low resistance to frosts, drought and parasites. To the harm caused by these original defects, the injury caused by neglect or unsuitable pruning, manuring, tillage of the soil and control of parasites is frequently added.

As for pruning, while the necessity of practising it at short intervals, possibly every year or at least every two is being gradually recognized, still the custom of pruning every three or four years is still very prevalent; there are some important oil-producing districts, especially in the south. where as many as seven or eight and even ten years elapse between one pruning and the next (1).

In Italy there are some centres in which capable pruners are found and they are much esteemed and sought for abroad (Dalmatia, Istria, Greece). There are also schools which prepare pruners by means of practical courses. A wider diffusion of the sound principles of olive pruning would be very desirable, because in several regions nothing could be more capricious, superstitions and ignorant than the way in which this, the most delicate of cultural operations and intimately connected not only with the productiveness of the tree but with its vegetation and resistance to disease, is carried out. Some think that they must cut blindly, topping and even pollarding the tree; others treat the olive like the mulberry; others, again, scarcely touch the tree, notwithstanding the length of time that is allowed between the successive prunings, for fear of removing too much foliage (parts of Calabria, of Sicily, of Tuscany, of Liguria). Some lop off a main branch every other year leaving the rest untouched, with the idea of thus rejuvenating the tree (!) while in reality they favour the spread of canker (Umbria). Other pruners train the main branches nearly horizontally, hollow out the crown and cause the tree to produce a number of low hanging branches reaching almost to the ground (Bari, Potenza and Florence districts, part of Umbria, etc.), while others keep the whole framework of the tree almost vertical and remove all the lower branches or allow the tree to grow naturally, in neither case considering the special conditions of the tree nor the requirements of the variety, etc.

As for manures there are districts where little or no manuring is done, some in which manures are given once every three or four years, and others in which the olive tree is frequently and well manured. In general farmyard manures (from horse stables and cattle and sheep sheds) are given; sometimes pure sheep or goat dung or night soil is used. The animals are often run in the olive groves for the sake of their droppings; less frequently woollen rags, leather waste, hoof and horn shavings, fish residues, silkworm chrysalides, olive pomace and the like are applied as manure. Mineral substances, such as builders' waste, ashes and to a limited extent chemical manures, or vegetable matter, either previously rotted or not, such as seaweeds, swamp grasses, leaves of forest trees, weeds, pine needles, etc., are given. Lastly leguminous green manures (lupins, beans, vetches, etc.) (1) are used, but only to a very limited extent. Usually the olive trees grown together with other crops get the best treatment as they profit by the manure given to the latter.

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(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *L'olivo e l'olio in Italia*, Monograph presented at the International Exhibition in Paris, 1900.

IDEM: *Inchiesta eseguita sulla propagazione e concimazione dell'olivo*, 1912.

As for tillage, in general little is done: the ground is hoed or ploughed with a primitive implement at long intervals, generally once a year, or twice at the utmost, and this while drought is one of the weather conditions that has the most depressing effects upon the yield.

As for the discases that attack olive trees there are a number of them: canker, bacterial tumours, root-rot, olive fly, weevils, scale insects, *Psylla oleae, Rhynchites, Phlaeothrips,* fumago, *Cycloconium. Stictis Panizzei,* are the chief diseases which have always with more or less virulence attacked the olive tree already apparently suffering from senility. There is no doubt that at present the most injurious pests are *Phlaeothips* and *Cycloconium* the latter especially, both of them destroying the foliage of great extents of olive groves. *Cycloconium* is all the more dangerous inasumch as through the ignorance of the great mass of olive growers its action is especially insidious. The farmer notices an unusual fall of the leaf, usually, in spring, and gets alarmed. But soon, new leaves appear, the olive tree is again green and the farmer is reassured, especially when he sees a certain amount of bloom showing, which is the case if the disease is not far advanced. But meamwhile the flowers and the young fruit fall, the oil crop is nil, and by the end of the succeding winter or in spring the leaves fall again and more plentifully. The olive grower gets discouraged and abandons the olive trees to themselves, depriving them even of the scanty care until then bestowed upon them. This happens now in a great part of Italy and it is urgent to have recourse to the more or less perfect remedies that are known: that is to spraying with salts of copper in order to prevent the germination of the conidia of the fungus, and to the intensive culture of the olive tree as indirect means of increasing its vigour and resistance to disease.

Fortunately for Italy, by the side of the old unproductive and perishing olive groves there are others either recently planted or restored to vigour which are carefully tended, pruned, manured and systematically protected against diseases; these show clearly that no fear need be entertained as to the extinction of olive cultivation, but on the coutrary demonstrate its great utility, especially on hill slopes where no other culture would be possible or advantageous. And if the results of experiments recently conducted in various parts of Italy on the improvement, management and manuring of olive groves become widely known and lead to the following measures being adopted, there is no doubt the olive in Italy will soon resume its place among the most paying crops.

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(1) See pamphlets already quoted: CONSOCIAZIONE DEI COMIZI AGRARI ITALIANI, *Sulla concimazione chimica e con sovesci delle viti e degli ulivi. Risultati d'inchiesta in Italia.* — Prof. CIRO CUAGLIOTTI, relatore. Terni, 1912.

The most important measures for the improvement of the olive groves are: thinning out of those that are too crowded, thus freely admitting the sun, a great enemy of most parasites; gradually and systematically pruning the trees so as to oblige those that have grown too tall to throw out new branches nearer to the ground; replacing the old decaying trees by seedlings that have been grafted to the varieties most suitable to the various localities and which can now be easily prepared in every farm or can be bought from the best nurserymen of Tuscany (Pescia, Pistoia, Florence) and other parts of the country; a suitable arrangement of the steep slopes and using the hoe or the plough together with green manuring so as to keep the necessary moisture in the soil during the summer; returning to the soil the necessary fertilizers, particularly those containing phosphoric acid and potash (and lime in some cases), and lastly spraying with mixtures containing copper against *Cycloconium*, which operation is rendered easier by the thinning out and lowering of the crowns of the trees, and using eventually other treatments to control other pests.

The Recent Development of Cattle Breeding in Sweden.

by

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I. — INCREASE IN THE NUMBERS OF LIVE STOCK.

The northern position of Sweden makes it naturally more suitable for the rearing of live stock, particularly cattle, than for grain growing; this feature is all the more pronounced in the north, and Norrland produces only a very small proportion of the grain required by its inhabitants.

The live stock of the country consists of horses, cattle, sheep, goats, pigs, poultry and reindeer, the latter belonging to the nomad Lapps in the high north. The numbers at the end of 1911 were as follows:

Horses under three years	493 322	
Horses over three years	95 165	
		588 487
Cattle		
Steers	144 277	
Bulls	52 467	
Cows	1 837 035	
Young stock	655 830	
		2 689 609
Sheep		945 709
Goats		66 136
Pigs		951 164
Poultry		3 961 141
Reindeers		276 084

If the various classes of stock (horses, cattle, sheep, goats and pigs) are calculated as cattle units (1), we get the figures shown in Table I as indicating the increase in the numbers of live stock in Sweden in the last half century.

TABLE I.

Year	Cattle Units	Per 1000 inhabitants	Per 1000 acres of area	
			total	of arable and permanent grass
1865	2 591 037	630	26	245
1875	2 863 006	653	28	247
1885	3 093 955	661	30	252
1895	3 367 999	685	33	272
1905	3 406 961	643	33	265
1911	3 617 472	655	35	291

Thus the live stock population has steadily increased; but since 1895 the increase of the human population has been more rapid than it. The fact that the number of cattle units per area of land has steadily increased through this period would lead one to expect a similar increase in the area under green crops, and the agricultural statistics show that this is the case. This increase has been especially in root crops for feeding, but the yield of hay on the temporary grassland has also increased considerably.

Sugar beet growing hardly existed 25 years ago; by 1890 the yield was 220 700 tons and in 1911 it had risen to 950 300 tons. The crop of roots for feeding (mangels, carrots, turnips and swedes) increased from 3 235 000 bushels in 1865 to 98 351 000 bu. in 1911. In 1890 the crop of hay from temporary leys was 2 3/4 million tons, but lately it has exceeded 4 1/4 million. Green crops have also extended considerably, especially in the north, but there are no statistics for them. Further, the increase in grain crops has meant more straw available for feeding.

By means of this increase of fodder resources it has been possible to bring up the stock of animals; the development has been greatest with cattle and pigs, both in quantity and quality. The numbers of the horned stock of different types are shown in Table II.

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(1) One cattle unit = 2/3 horse, 1 beast, 8 sheep, 12 goats or 4 pigs, two young animals of any class are equal to one adult of the same class.

TABLE II.

Year	Steers	Bulls	Cows	Young stock	Total
1865	282 844	38 791	1 185 556	417 163	1 924 354
1870	269 762	38 674	1 231 477	426 014	1 965 927
1880	289 071	47 985	1 409 236	481 465	2 227 757
1890	253 735	49 066	1 578 927	517 763	2 399 491
1900	218 932	51 390	1 764 819	547 414	2 582 555
1905	184 328	49 444	1 763 857	552 299	2 549 928
1910	152 925	54 703	1 861 219	678 679	2 747 526
1911	144 277	52 467	1 837 035	655 830	2 689 609

Only the steers have shown a permanent falling off in numbers; as they are kept in Sweden only for work, this is due to the increase in the wages of labour, which has made horses more economical owing to their quicker going. The fact that the number of bulls has not increased as rapidly as that of cows, or has even decreased in some years, is probably the result of the extension of cooperative bull societies, which has meant considerable economy in the number required. Except for a slight relapse in 1911, caused by shortage of crops, the cows and young stock have shown a large and steady rise in numbers, reaching over 55 per cent. in the period.

For a just appreciation of the enhanced value of the horned stock, more attention must, however, be given to the improvement in quality, which has greatly exceeded the numerical increase

II. — IMPROVEMENT OF THE BREEDS.

When towards 1840, general interest began to be aroused in Sweden in the improvement of the cattle, the prevalent opinion was that the indigenous breeds were so inferior that the only way to improve them was by crossing with well-known breeds from other countries. A number of herds of various breeds were imported to find which would be the best for the purpose. The only two breeds which gained the confidece of farmers were the East Friesian (from Holland and Ostfriesland), and the Ayrshire; these breeds have become so widespread and have been so largely used for crossing that the indigenous breeds have almost entirely disappeared in the southern and central parts of the country, the introduced breeds have taken their place either pure or as crossbreds. A reaction against this excessive importation began towards the end of the century. The two introduced breeds had developed so well that it no longer seemed necessary to depend on continued importation, which was always uncertain for the breeder; little by little importation has become less important, and rational selection of the breeding stock has led to such a development of national breeding that Swedish East Friesians and Ayrshires can compete with the animals in their original homes; recently stock of both breeds has been exported at very good prices.

Besides this, some more or less wholly indigenous races have been developed. In Central Sweden there were a number of gentlemen's herds descended from the native red or yellow cattle, but containing a good deal of Dutch, Shorthorn and Ayrshire blood; they combined a good milk yield with considerable weight and early maturity. The owners of these herds combined to form a uniform breed without using imported animals, and their efferts have been so successful that the race thus evolved, the Red Spotted Swedish, has now been recognized as a pure breed. They are most like Ayrshires, but make better butcher's beasts than these.

While the above-mentioned breeds have done well in the more fertile parts of central and southern Sweden, the same cannot be said of the north of the country, where feeding is much more scanty and the beasts have to find their food in the forest in summer. In these parts, the indigenous polled cattle, white or spotted on a white ground, was retained; this breed, known as the Fjäll, gave little in the way of milk or meat, but was accustomed to unfavourable natural conditions. It was generally believed that the low production was a direct result of the conditions of life, and that nothing better was to be expected. All the same, a beginning was made some thirty years ago at attempts to improve the breed by better feeding and selection of the best milking strains. The result of these efforts is that there are now a number of small herds which give an average yield of 6000 lbs. and more of milk a year, a very satisfactory amount in consideration of their live weight; this, though increased a good deal, hardly exceeds 750 lbs. for cows.

The uncertainty as to choice of breeds has now ended, and each district has fixed on one or more of the four breeds mentioned: 1) East Friesian, in the most fertile districts; 2) and 3) Ayrshire and Red Spotted Swedish, where the conditions are not quite so favourable; and 4) Fjäll, where the poor alpine and forest pastures have to be used.

Besides the Fjäll there was another polled breed, red in colour, of which only a few remnants remained scattered in out-of-the-way districts in various parts of the country. In the last few years these have to some extent been collected together to make a pure breed, the Swedish Red Polled cattle, and the results already obtained with some herds look encouraging.

III. — MILK YIELD.

The progress realized in the productivity of the cattle can also be seen from the figures for production of milk and butter and for increase of live-weight. The official statistics do not give direct information on these points, but our statisticians have attempted to estimate the figures for milk production. Thus M. Gustav Sundbörg works out the average milk yield per annum as follows:

About	1870	2 600 lbs. per cow
»	1880	3 100 » »
»	1890	3 700 » »
»	1903	4 200 » »

Another author, M. Nils Hansson, an authority on the dairy-farming of the country, has estimated the present milk yield at an average of 4730 lbs. The three first figures of M. Sundbörg's table are very uncertain, as they come from a pure estimation of the production of the different provinces, in which the breeds, feeding and management are very variable. The figure for 1903 is already an improvement, as it is the result of estimations of the mean annual production made in every parish throughout the country; the 1912 figure is still more trustworthy, as it is based on the latest reports from the Dairy Control Societies.

Under these societies, numbering 749 in 1911-12, no less than 215 742 cows, or nearly 11 per cent. of the total number in the country, were submitted to careful control; the results are as follows.

The mean annual yield per cow was 5748 lbs. of milk, with an average fat content of 3.50 per cent., corresponding to 201 lbs. of butter-fat or 238 lbs. of butter. As the control herds are among those in which systematic efforts for improvement are made, M. Hansson has deducted 20 per cent. from this yield to get the average for the whole country, giving the figure quoted above.

The great variation of yield in different parts of the country can be shown by parallel figures from the two provinces giving respectively the highest and lowest yield (Table III).

TABLE III.

Province	Average yield		Number of cows under control	
	milk lbs.	butter lbs	total	percentage of total stock
Malmöhus: average	8 087	289,6	46 084	32.6
highest society	10 392	364,8	324	—
lowest society	6 200	239.3	64	—
Vesterbotten: average. . . .	4 388	154,3	2 569	3.9

On the basis of these figures, the total milk prodution has been calculated as follows:

1875	about	3100	million	lbs
1885	»	4100	»	»
1895 , ...	»	5400	»	»
1905	»	6600	»	»
1910	»	13200	»	»

The progress in milk production led to a corresponding development of the dairy industry. Formerly the treatment of milk was a household affair, and it was not till 1865 that the first dairies were started. The earliest ones were established by the owners of large estates to use the milk from their herds; these may be called "*estate dairies*"; but gradually *commercial dairies* came to be started by private persons or companies. They were not connected with any form of farming and treated purchased milk. The great profits which the proprietors of these dairies often made and the difficulties which arose from the lack of interest of the farmers in the quality of the milk sold to the dairy, combined to produce general discontent with this type of dairy; towards 1890 *cooperative dairies* were started; in these the farmers shared according to the amount of milk supplied and the fat content was soon also taken into consideration.

This type of organisation has proved very advantageous, both as regards better quality of the milk and the products turned out, and in giving better financial results. The consequence is that the cooperative dairies have gained on the estate and commercial ones, as shown by the figures in Table IV.

TABLE IV.

	1890	1900	1905	1910
Total number of dairies . .	1 562	1 793	1 575	1 461
Estate	809	624	399	
Commercial	610	529	536	
Cooperative	73	302	470	
Milk treated . . . . . lbs.	1 115 784 000	1 856 909 000	2 024 050 000	2 533 590 000
Butter produced . . . »	35 480 000	58 657 000	62 791 000	73 985 000

The diminution in the number of dairies in the last few years is due to a concentration of the industry, consisting in the disappearance of many small competing establishments in favour of larger and better organized ones.

The chief object of the Swedish dairy industry has always been the production of butter; a part of this, increasing up to 1896 has been exported particularly to England, to which country it goes direct or via Denmark.

The total exports for the last fifty years have been in round numbers:

1861-65	355 800 lbs.	1886-90	31 074 000 lbs.
1866-70	248 900 »	1891-95	44 147 000 »
1871-75	6 954 700 »	1896-1900	48 074 000 »
1876-80	9 248 000 »	1901-05	42 718 000 »
1881-85	17 678 000 »	1906-10	40 857 000 »
1912	45 717 000 lbs.		

VI. — BUTCHER'S BEASTS

Before the beginning of the dairy industry and the exportation of butter, attempts had been made to export live cattle to England. The success of this enterprise was not great, owing to the poor quality of the Swedish cattle; but as the increasing interest in milk production gradually led to better feeding and consequent greater body development, the exportation of butcher's beasts became more important, till it was put an end to in 1892 by the prohibition of introduction of live cattle into the British Isles. Efforts to turn the exportation to Germany were also soon frustrated by similar measures in that country, but since the beginning of the new century exportation of live cattle and meat has developed again; it is directed chiefly to Germany and Switzerland.

TABLE V.

Annual exportation of cattle and meat from Sweden.

Year	Bulls	Steers	Cows	Young stock	Value
					£
1881-85	1 207	30 660			317 400
1886-90	2 489	13 135	15 265	1 981	368 600
1891-95	3 935	5 481	9 300	955	203 650
1896-1900	2 292	1 253	5 265	1 010	103 550
1901-05	3 577	404	7 038	3 558	118 900
1906-10	3 365	563	8 284	4 971	190 950
1911	6 974	6 946	19 711	13 340	566 200

The importation of live cattle and meat into the northern industrial districts, chiefly from Finland, has never been of much importance. In 1911 the value was £. 34 600.

Naturally the better feeding has increased the live weight of the cattle. Statistics do not give any direct evidence on this point, but it can readily be demonstrated from material taken from the reports of the breeding societies. Thus, the normal weight of Ayrshire cows, which are the most widespread in the central and southern provinces, was estimated at 1000 to 1050 lbs. about 1890; at present it averages 1100 lbs. The weight of Friesian cows, which are kept chiefly in the fertile province of Malmöhus, has also improved, and is now reckoned at 1300 lbs. The Red Spotted Swedish, developed chiefly by crossing with Ayrshires, occupies an intermediate position between these two breeds as regards live weight of the cows. The same progress can also be observed in the two native polled breeds — the Fjäll (white and spotted), predominating in the north, and the Swedish Red Poll, which is the most southerly branch of the hornless cattle. For the Fjäll breed, the normal weight of the cows was estimated at 660 to 700 lbs. in 1890, and it now reaches 770 to 810 lbs.; the live weight of the Red Polls may reach even 840 or 880 lbs.

V. — ORGANIZATION.

The development in the stock of cattle to which we have drawn attention is naturally the result of the efforts and care of the farmers themselves, but it has been greatly encouraged and facilitated by various measures taken by the authorities carried out at the public expense. In the first place should be mentioned the regular shows, with prizes distributed on a uniform system ("Flach System"); these were begun in the province of Skaraborg in 1882, and in 1892 were organized in all the provinces with the help of grants from the Government and the Agricultural Societies; each province forms a prize district. The idea of these shows is to bring to light all animals fit to be used for breeding and to classify them by prizes according to their value for the purpose. For each approved cow, the owner receives a service ticket for each year, giving the right to put the cow to a prize bull of the same breed; the owner of the bull is then paid for the tickets at a rate depending on the class in which the bull was placed.

These shows are specially intended to improve the stock of small farmers, and they alone are entitled to prizes and service tickets for cows. But, owing to the sums brought in by the service tickets to the owners of specially good bulls, the Flach system also encourages high-class breeding among the wealthiest farmers.

These shows, which are generally held every other year in a locality, have been very valuable in bringing farmers to recognize the importance of breeding from good stock. Another result has been that in each district one or two breeds have been fixed upon as specially appropriate for the natural and economic conditions of that district.

The shows have continued to increase in number, and at the same time the proportion of the cows approved has become higher. In 1910, 62 670 animals were examined, and 55917, or 89 per cent., were approved or given prizes. The expenses for the year reached about £18 000.

As we have just shown, the giving of prizes and the money brought in by service tickets may make the keeping of bulls a profitable business; to this circumstance is due the formation of coperative bull-keeping societies. The provincial agricultural societies encourage these societies by loans without interest for the purchase of bulls and by special prizes at the shows. The formation of these societies has developed at about the same rate as the shows, and there are at present about 1200 of them, distributed throughout all the provinces of the country.

Another measure in connection with the shows has been the establishment of herdbooks for the more important breeds. These have generally been drawn up and published by the provincial agricultural societies soon after the starting of shows on the system described. Registers for certain breeds have also been established by the societies for the improvement of these breeds (Ayrshire and Red Spotted Swedish). Lastly, the Government has undertaken the preparation of herdbooks for one or two breeds; of these, the Ayrshire is the only one yet published, but the Fjäll will appear shortly.

Next to the shows, the Control Societies have contributed most largely to the great progress in live-stock breeding and the improvement of the economic position of stock farmers. The first society of this nature was founded in 1898, and at the and of 1912 the total number was 749, distributed through all the 24 provinces of the kingdom. The largest number, 160, is in the province of Scania, which is the most populous and best cultivated part of the country; but these centres of advancement in the economy of live stock occur right up to the desolate regions of Lapland.

The effects of the regular control organized by these societies have everywhere been seen in the disappearance of the cows that gave the smallest return for the food consumed and in a more severe selection of the animals to breed from; the consequence is that the average milk yield has shown a more or less rapid rise. In the earlier years this rise was largely due to better feeding; the amount of food per cow, as well as in relation to the milk yield, often rose for a time; but the farmers soon learnt to make up more suitable rations, and the number of fodder units diminished in proportion to the milk produced, and often also absolutely.

By publishing the results obtained yearly for each herd, the control societies very soon made known the productive capacity of the herds as well as of the individuals composing them. From the beginning of the present century, the control figures for the production of milk and butter-fat have been used along with the external points and pedigrees for judging the animals at the great national shows held every five years (last in 1911). But these control figures are not deemed sufficient for judging the breeding value, especially in highly selected strains.

To meet the need for more searching examination of the animals for this purpose, which is particularly required in the distribution of the great State prizes for breeding stock, competitions of breeding centres have been established. The herds entered for these competitions are submitted to careful control for two years; the observations extend to quantity of milk and butter-fat produced and consumption of food for each cow, and uniformity, health and vigour for the herd in general. Such competitions have been arranged twice, in 1903 and 1908, and a third will begin this year. The distinction of being classed as a breeding centre has been found to be of such considerable commercial advantage that at present money prizes are no longer distributed except for herds of the Fjäll breed, which as a rule belong to small farmers.

The direction of the official measures just described is entrusted to committees appointed by the Government and the Provincial Agricultural Societies; but besides these, the breeders have formed societies for the different breeds; The first of these was the Red Spotted Swedish Society, formed in 1891; in 1899 the Swedish Ayrshire Society was founded for the development and consolidation of the various strains of Ayrshires occurring here and there over a large area, and of very varying types. These two societies organized the registering of animals descended from those entered in the Ayrshire Cattle Herd Book and given a certain annual yield of butter-fat. For the Red Spotteds, cows must give 220 lbs. of fat, and bulls must be out of dams giving 265 lbs. The minimum for Ayrshire cows is 242 lbs. during each of two successive years.

To facilate the purchase of good breeding stock, each of these societies organizes two auction sales a year; at these, registered bulls, free from tuberculosis and approved at an inspection immediately preceding the sale, are offered to the public.

During the present year, two new societies have been founded to work on the same lines as those already mentioned, one for the Friesian breed and the other for the Swedish Red Polls.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

DUCATION
ND EXPERI-
NTATION IN
RICULTURE
D FORESTRY

1126 - **National School of Waters and Forests at Nancy (France).** — GUINIER PH. in *La Vie agricole et rurale*, Year II, No. 35, pp. 224-230. Paris, August 2, 1913.

A State School of Forestry was founded in France in 1824, and two years later was established at Nancy where its headquarters have remained ever since. These consist both of educational buildings and of residential quarters for the State scholars and for the staff; special mention should be made of the museums, where extensive forestry collections of different kinds have been accumulated. There are further 7625 acres of forest under the direct management of the School; the greater part of this is in the neighbourhood of Nancy (Forests of Haye and of Amance) and the rest in the Vosges Mountains about 40 miles distant (Forests of Elieux and of Ban d'Etival). These four forests provide examples of various types of soil and of forest management, and together with a nursery on the outskirts of the Haye Forest, where there is also a piscicultural experimental station, and an arboretum at Amance, complete the equipment of the School.

The students may be divided into two classes: the so-called "regular" students or State scholars and the "free" students. The former are men who have already taken their diploma at the State Agricultural College ("Institut National Agronomique") and have further been submitted to a competitive entrance examination in mathematics and modern languages. Occasionally a graduate of the Polytchnic School ("Ecole Polytechnique") is admitted directly and without competition. The total number of these State scholars varies from 12 to 35 according to the needs of the Forest Service, and at present they number 18. When entering the School they sign a contract for four years, the first and last of which are spent doing military service, while the two intermediate yeas are spent at Nancy. During the latter period, the scholastic year is divided into two terms: the winter term from October to April, when the work consists chiefly of lectures and laboratory work, and the summer term April to August, when the work is wholly of a practical nature and takes place in the School forests. Further, during the two years, two months are spent visiting forests in other parts of France, and throughout the whole course a certain amount of military instruction is given and a fairly strict discipline is maintained. After leaving Nancy the State students complete their military service by serving for a year as sub-lieutenants in an infantry regiment and then pass into the State Forest Service.

The second class of students consists chiefly of foreigners, who are admitted to the School and allowed to follow the course of instruction wholly or in part. The latter embraces forestry and its applied sciences, forest surveying and forest law.

The teaching staff consists of seven members of the Forest Service, a military instructor, and a lecturer in Letters and modern languages, while the management of the School forests is in the hands of two special forest officers who were originally appointed to take charge of the experimental work.

1127 – **Travelling Schools for Rural Domestic Economy (France).** — DUCLOUX, A. in *La Vie agricole et rurale*, Vol. 2, No. 38, pp. 305-308. Paris, August 23, 1913.

Though the first travelling school for Rural Domestic Economy in France was only founded in December 1905, at the present day 30 such schools exist, 2 others are to be opened shortly, and the formation of yet 6 others is under discussion. Many of them give short summer courses in training colleges of their districts. On the whole it may be said that the instruction is being appreciated by farmers and their families, and that the movement is proving a success.

1128 - **The Agricultural Institutions of Spain.** — DE LA ROSA, GUMERSINDO FERNANDEZ. Apuntes históricos sobre los progresos de la agricultura española en los cinquenta años ultimos. — *Boletin de agricultura técnica y economica*, Year V, Nos. 49-54, pp. 63-72, 167-176, 236-244, 335-345, 449-460, 521-532. Madrid, January-June, 1913.

AGRICULTURAL INSTITUTIONS

This article gives a historical summary (accompanied by general remarks on rural and political economy) of the more important facts concerning the progress of agriculture in Spain, especially in the south-west district, during the course of the last fifty years. The writer brings into prominence the measures taken by the Government for the encouragement of agriculture and agricultural instruction.

A Royal Decree of 1855 founded the " Escuela general de Agricultura ". Two of the first agricultural engineers who studied there founded, in 1862, the " Sociedad El Fomento Agricola " at Jerez de la Frontera; to this society is due the introduction into Spain of the first mowing and threshing machines. These innovations, and the introduction of *Hedysarum coronarium* L. (" sulla "), which necessitated horse-rakes and hay-makers, into the southern coast district of the Peninsula, gave a great impetus to agriculture and to stock-breeding industries in that district.

From 1875 to 1879, the extension of the " Instituto Agrícola de Alfonso XII " was provided for by a series of legislative enactments. This Institute was the former "Escuela general de Agricultura". The law of August 1, 1876, dealing with agricultural instruction, created chairs of agriculture in all the colleges ("Institutos") of the Kingdom. The "Asociación de agricultores de España" dates from about the same time, and has the merit of having organised shows, competitions and congresses. The "Exposición Nacional Vinicola" of 1877 was on a magnificent scale. Unfortunately, phylloxera made its appearance shortly afterwards in Spain, and destroyed over 7 million acres of vineyards. The spread of the pests was arrested by reconstituting the vineyards with vines on Amerian stocks.

The Royal Decree of February 14, 1879, created the "Cuerpo de Ingenieros agronomos", and the "Junta consultiva inspectora". In 1881, a stallion depôt was added to the "Instituto Agricola de Alfonso XII", which was later attached to the "Estacion pecuaria de la Granja central"; this latter is still in existence.

The Royal Decree of December 9,1887, gave its sanction to the organisation of the Corps of Agricultural Engineers; another decree dated December 13, 1887, provided for the creation of different Experimental Farm Schools ("Granjas-Escuelas experimentales de Agricultura"). The "Granja experimental" of Saragossa contributed in a great measure to the improvement of beet cultivation; this crop has in some parts (in the neighbourhood of Malaga and Motril) replaced sugar cane. The first beet sugar factory was established in 1882 at Cordova; others were subsequently opened at Grenada, Antequera, Aranjuez and Vico.

The oldest of the model farms which still exists is (after the "Granja central", annexed to the Agricultural school of Moncloa) that of Saragossa, which was established by Royal Decree of September 23, 1881. The same decree also created the model farms of Grenada, Seville and Valladolid; these were, however, suppressed after some years. A Royal Ordinance of June 2, 1882, instituted the "Granja levantina," which is situated in the "Jardin Real" near Valencia; on January 16, 1889, the "Granja-Escuela experimental" of Jerez de la Frontera was created, followed during the same year by the model farm of Corunna, and the next year by that of Barcelona. Those of Valladolid, Valencia, Jaén, Badajoz and Ciudad Real have only been in existence for some ten years; the model farms of Navarre and of Santa Cruz (Teneriffe) are in course of development; those of Melilla (created in 1910), Salamanca (created 1911), Cordova, and the Balearic Isles (created in 1912) are beginning operations.

To the "Escuela Especial de Ingenieros agronomos" and the "Granja Central" are annexed stations for the following branches: agriculture, plant diseases, seed selection, vine growing, stock breeding and machine testing. For a long time, vine-growing stations have existed at Haro, Villafranca del Pandaes, Toro, and Reus (the latter is now transformad into the school of Vine Growing and Wine Making); while those of Calatayud, Cocentaina, Jumilla, Requena, Valdepeñas, Aranda de Duero, Felanitx (Balearic Is.) and Orense are of more recent date. Funds hare been granted for the establishment of 14 "Estaciones de Agricultura generale" at Arevalo, Albacete, León, Lorca, Segovia, Zamora, Asturias, Burgos, Castellón, Motril, Malaga, Cáceres, Fonsagrada and Alcalá de Henares. There is a Sericulture Station at Murcia, and others are about to be established at Aranjuez and Puerto de Santa Maria (Cadiz). Dairy Industry Stations exist at San Felices de Buelma (Santander) and at Nava (Oviedo); and there are Stations for Irrigated Crops at Binéfar (Huesca), as well as at Seville (" Granja provincial de Alfonso XII "), a Rice Culture Station at Huesca (Valencia), and experimental oliveyards at Tortosa (Tarragona), Hellin (Albacete) and Lucena (Cordova).

The law of July 17, 1895, regulates surveying operations. In accordance with Royal Decrees of August 14 and of October 20, 1895, a trial beginning was made in the Province of Grenada. The law of August 24, 1896, provided for the establishment of the survey of crops. In 1899, surveys were made in the Provinces of Cadiz, Cordova, Malaga and Seville. The present detailed survey was regulated by the law of March 23, 1906.

Since 1900 the Government has given a great impetus to irrigation works. The Royal Ordinance of 1903 commanded the publication of the work entitled " El regadío en España " (Irrigation in Spain) compiled by the Council of Agriculture from the reports forwarded from the provinces by agricultural engineers. The Royal Decree of May 11, 1900, reorganized the Hydrological Service; seven divisions were created for hydraulics, and important studies for canals and reservoirs were begun; some of these are in course of construction. At the present time, Spain possesses nearly 4 million acres of irrigated land (counting the areas which are irrigated when water is abundant).

It has long been known that the cotton plant flourishes in some parts of Spain; nevertheless, the Spaniards have almost entirely ceased cultivating this crop. With a view to encouraging the cotton-growing industry, the law of July 19, 1904, granted £16 000 in prizes (to be awarded over three years), and also exempted the cotton crop from taxation. The Council of Agriculture was charged with drawing up the regulations for the execution of the said law, but their precautionary and restrictive measures (published by Royal Decree on January 28, 1906) made the latter a dead letter.

In conclusion, the writer gives some suggestions as to the part which should be played by the Government and the administration in the encouragement of agriculture, and the best measures to be adopted in order to secure success.

1129 – The Financial Measures of the Prussian Chamber of Agriculture. — ASMIS in *Volkswirtschaftliche Blätter*, Year XI, No. 10-11, pp. 135-138. Berlin, June 10, 1913.

In order to guarantee for the future the financial resources of the German Chambers of Agriculture, the law of June 30, 1894, dealing with the said Chambers, accords to them the right of levying a certain tax upon the agricultural properties of their district which are over a certain size.

§ 19 of the above mentioned law runs as follows:

" The total tax levied must, in general, not exceed one-half per cent. of the net return of the land tax; only in extraordinary cases, and with the authorisation of the Minister, may this figure be exceeded ". This paragraph

TABLE I. — *Taxes levied by the Chambers of Agriculture.*

Districts	For the financial year 1903-04		Percentage of net return of land tax						For the financial year 1910-11	
	% of net return of land tax	Total £	1904-05	1905-06	1906-07	1907-08	1908-09	1909-10	% of net return of land tax	Total £
East Prussia	1/2	5 485	1/2	1/2	1/2	1/2	1/2	1/2	17/20	9 150
West Prussia	5/12	3 530	5/12	1/2	5/12	1/2	1/2	1/2	2/3	5 625
Brandenburg	4/10	6 524	4/10	4/10	2/5	7/10	17/20	17/20	1	17 007
Pomerania	1/2	6 705	1/2	1/2	1/2	1	1/2	2/3	2/3	8 906
Posen	1/2	4 826	1/2	1/2	1/2	1/2	1/2	1/2	3/4	7 073
Silesia	1/4	5 764	1/4	1/4	5/12	5/12	5/12	5/12	1/2	11 603
Saxony	1/3	8 443	2/5	2/5	2/5	2/5	1/2	1/2	1/2	12 849
Schleswig-Holstein	4/10	6 728	2/5	4/10	1/2	1/2	1/2	1/2	1/2	8 842
Hanover	1/3	7 396	1/3	1/2	1/2	1/2	1/2	1/2	7/10	15 540
Westphalia	4/10	5 156	1/2	1/2	1/2	1/2	1/2	1/2	1/2	6 392
Hess-Nassau	—	—	—	—	—	—	—	—	—	—
a) Cassel	1/2	2 717	1/2	1/2	2/3	2/3	2/3	2/3	2/3	3 613
b) Wiesbaden	5/8	2 068	5/8	5/8	5/8	3/4	3/4	7/8	1	3 358
The Rhine Province	1/2	8 384	1/2	1/2	1/2	1/2	3/4	3/4	3/4	12 516
Hohenzollern	—	195*	—	—	—	—	—	—	—	294
Total		73 922								122 768

* Contributed by the Members of the "Verein für Landwirtschaft und Gewerbe".

also mentions that the Chambers of Agriculture must publish an annual balance sheet, and submit the latter to the Minister, while at the same time they have complete autonomy in the management of their bank, and their book-keeping operations.

Table I, which is based upon the "Statistische Nachweisungen aus dem Gebiete der Landwirtschaftlichen Verwaltung von Preussen", shows how during recent years the Chambers of Agriculture have used the power entrusted to them.

This table reveals a tendency to the progressive increase of the tax; while in 1913 there were still seven out of the thirteen Chambers of Agriculture of Prussia which had not reached the legal limit of a levy of ½ per cent. on the net return of the land-tax, and only one which had already over-stepped that limit, in 1910 none of them had remained within the limit, and nine of them had already, with the authorization of the Minister, passed it. The total sum of the taxes collected by the Chambers of Agriculture was about £ 70 000 in 1903, and amounted in 1910 to about £ 120 000.

Table II shows the total expenses of the different budgets of the Chambers of Agriculture since 1903.

After a comparatively slight increase in the expenditure from 1903 to 1904, since the latter date there has been a regular increase of about £ 50 000 in the annual expenses of all the Chambers of Agriculture, since they rose from about £420 000 in 1904 to about £700 000 in 1910. This increase is noticeable in all the clauses of the budget, but especially in the one dealing with the encouragement of forestry, which has risen from £3100 to £11200, *viz.* three or four times the original sum.

The chief increase in expenditure is furnished by the sections providing for the encouragement of scientific work and instruction, and for the promotion of stock breeding. These two sections alone represent the chief work of the Chambers and account for over half their expenditure.

The progressive increase of the receipts corresponds, in some measure, to that of the expenses. The receipts proper to the Chambers are by far the largest and they have increased much more rapidly than the Government grants. Indeed, since 1903 the receipts proper of the Chambers of Agriculture have risen from £230 000 to £460 000, while during the same period the Governmental grants have increased from £120 000 to £190 000.

As appears on comparison with Table I, the increase in the expenses proper of the Chambers does not so much depend upon the increase of the land-taxes (*i. e.* their more strict enforcement) as upon the larger receipts from other sections of the Chambers (duties, school fees, sale of publications, etc.).

The figures given show very clearly the extraordinary development of the work of the Prussian Chambers of Agriculture.

TABLE II. — *Budget of the*

	EXPENDITURE					
Financial Year	I For scientific objects and instruction	II For veterinary attendance	III For the encouragement of stock breeding	IV For the encouragement of fish breeding	V For the encouragement of forestry	VI For the encouragement of fruit growing, vine growing and horticulture
1	2	3	4	5	6	7
	£	£	£	£	£	£
1903 . . .	116 857	24 938	95 503	2 778	3 113	12 529
1904 . . .	120 317	21 480	98 805	2 392	4 420	14 603
1905 . . .	132 363	34 224	105 497	2 497	5 476	15 055
1906 . . .	138 152	36 799	111 459	2 951	6 247	14 518
1907 . . .	161 839	37 675	131 190	3 388	6 616	16 376
1908 . . .	172 974	40 018	135 891	3 572	7 252	16 060
1909 . . .	213 505	40 478	147 625	5 030	8 238	20 611
1910 . . .	255 305	43 774	155 391	5 773	11 150	18 412
In 1910 the "Verein für Landwirtschaft und Gewerbe" in Hohenzollern was						
	632 ½		915	1 ½	-	54

N. B. — The great increase in the figures in column 2 « Scientific objects and instruction», that the cost of periodicals and other publications of the Chambers was no longer charged instruction.

1130 - **Resolution of the Swedish Authorities on the Subject of the Future Position of the Swedish Station for the Improvement of Seeds.** — *Sveriges Utsädesförenings Tidskrift*, pp. 142-223. 1913.

The Svalöf Station for the improvement of field crops, founded in 1886 by private initiative, has hitherto belonged to the Swedish Association for the Improvement of Seed, notwithstanding the fact that the increasing subventions granted by the State have rendered it more and more dependent upon the Government. (1)

Owing to the always greater extension of its work and to the desire

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(1) See Dr. HJALMAR NILSSON'S original article: « The Swedish Institute for the Improvement of Field Crops at Svalöf », *B.* June 1913, pp. 834-843. (*Ed.*).

Chambers of Agriculture.

			RECEIPTS			
VII Grants to agricultural societies and for the encouragement of agriculture in general	VIII Administration of the Chambers	Total expenses	Total receipts	Government grants	Other grants from Provinces, ecc.	Receipts proper
8	9	10	11	12	13	14
£	£	£	£	£	£	£
69 976	77 771	403 465	399 823	123 628	39 796	236 399
76 461	75 779	414 255	417 829	131 775	38 844	247 210
73 878	92 350	459 871	455 373	138 647	39 631	277 095
101 280	97 115	508 519	508 343	146 476	43 195	318 672
101 934	126 227	585 242	572 040	162 068	49 561	360 412
137 366	112 144	625 276	616 015	182 355	55 284	378 377
107 278	112 692	655 456	659 633	179 678	56 530	423 425
123 964	90 049	703 775	697 804	187 492	56 427	453 885

included for the first time. It furnished the following figures:

186	163	1 952	1 899	1 471	15	413

and the large decrease in the admnistrative expenses (column 9) in 1910 are due to the fact to administrative expenses, but to the fund for the promotion of scientific objects and

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to give the employees of the establishment a surer and more advantageous position, a request for the increase of the subvention was made (the increase is so considerable that out of the total required revenue, estimated at £7 414, the subvention alone figures for £4 950), and the question was raised whether the State should not take over the establishment as one of its institutions.

This change was supported by the Royal Direction of Agriculture (K. Landtbruksstyrelsen), which proposed however that the establishment should be managed by a special board nominated by the King and consisting of seven members.

In order to ensure intimate cooperation with the Central Institute that the State possesses at Stockholm, in which other branches of agricultural experimentation are carried out, it was proposed that two of the members should be on the board of both of these institutions.

According to the measures proposed by the Government and approved by Parliament, the establishment will continue to belong to the Swedish Association for the Improvement of Seeds, in order that it may preserve that liberty of form which seems to have been so favourable to its development. The managing committee will consist of seven members, of whom five will be nominated by the Government and two by the Association for the Improvement of Seeds; a close cooperation with the State Central Institute will be obtained by means of two members belonging to both boards and by the discussions of the scientists of the two institutions. A laboratory will be installed for the chemical experiments required by the establishment. The State subvention is fixed at £4 950 for the year 1914. It is estimated that the Association that receives the improved seeds and disposes of them commercially will give £2 200, while other sources of revenue will yield £264.

In case the sum that the commercial association will have to pay according to the agreement approved by the Government should exceed the sum estimated in the budget, the excess will be put aside as an asset for the budget of the following year, thus allowing the contribution of the State to be diminished.

AGRICULTURAL SHOWS AND CONGRESSES

1131 - **Agricultural Shows.**

Belgium.

1913. Nov. 8-10. Brussels. — Poultry show organized by the Brabançonne Club. Address to: M. Pirard, Nivelles, or M. W. Collier, 97 Rue des Cailloux, Jette.

Nov. 8-10. Borgerhout (Antwerp). — National poultry show organized by the "Neerhof" Society of Borgerhout. Address to the secretary: M. Eug. Dierkx, Chaussée de Turnhout, 221, Borgerhout, Antwerp.

Nov. 15-17. Renaix (East Flanders). — International poultry show organized by the Pigeon Club. Address to the president: M. Otto Rose, Renaix.

Nov. 15-17. Charleroi. — International rabbit show organized by the "Cunicole Club" of the Charleroi valley. Address to: M. Pévenasse (secretary of the club), Charleroi

Nov. 29-30. Ghent. — Annual international poultry show organized by the "Neerhof" Poultry Society. Address to the secretary: M. A. Heyndrickx, 3 Rue du Saint Esprit, Ghent.

Dec. 14-15. Mont-sur-Marchienne. — National poultry show organized by the "Cercle avicole et cunicole". Address to: M. Léopold Germain, Place du Wez, Mont-sur-Marchienne.

Dec. 20-22. Antwerp. — Eleventh international poultry show, organized by the "Cercle avicole anversais". Address to: 28, Rue Torfs, Antwerp.

1914. Feb. 7-9. Iseghem (West Flanders). — Fourth international poultry show organized by the "Hoenderbond 't Neerhof". Address to: M. Valère Laridon, Café Royal, Iseghem.

France.

1913. Nov. 12-16. Paris, Grand Palais. — International poultry show organized by the "Société Nationale d'Aviculture de France". This show will include fowls, ducks, geese, turkeys, rabbits, pigeons and dead poultry; there are a great many prizes in kind, an object of art offered by the President of the French Republic, money prizes from the Ministry of Agriculture and the General Council of the Seine, gold and silver medals, etc.

1914. Jan. 17-19. Lille. — Fifteenth international poultry show organized by the "Les Aviculteurs du Nord" Society. Address to the general secretary: M. Emile Desreumaux, 92 Rue Franklin, Roubaix, Nord.

March. Nice. — General agricultural and horticultural show organized by the "Societé Centrale d'Agriculture et d'Horticulture". Address to the secretary: 113, Promenade des Anglais, Nice.

May - November. Lyons. — Permanent horticultural show, comprising: fruit-bearing and ornamental plants; instruments, machines and apparatus for use in the various branches of horticulture; plans, designs, books and publications on the subject. There will be three temporary shows of horticultural produce, as follows: June 5-9, Sept. 4-9; Nov. 21-27. Horticulturists and amateurs wishing to exhibit should make application in writing to the Mayor (M. le Maire de Lyon, Secrétariat de l'Exposition, Hôtel de Ville, Lyon), twenty days before the opening of each of the shows, indicating the number and nature of the exhibits and the space required.

Germany.

1913. Oct. 22-23. Königsberg. — Sixty-first show and sale of live stock, organized by the "Ostpreussische Holländer Herdbuch-Gesellschaft". The catalogue of the animals shown may be obtained from the offices of the society: Beethovenstrasse 24-26, Königsberg i. Pr.

Nov. 22-23. Karlsruhe (Baden). — Rabbit show organized by the "Badenia" Rabbit Society..

1914. May 5-7. Berlin. — Thirty-eighth Berlin Fat Stock Show.

German East Africa.

1914. Daressalam. — General exhibition for German East Africa, organized by the Permanent Exhibition Committee for German Industries ("Standige Ausstellungs-Kommission für die deutsche Industrie"). Address: Berlin, N. W. 40, Roonstrasse 1.

United States of America.

Cattle shows and fairs:

1913. Oct. 28 - Nov. 7. Jackson, Mississippi.
Nov. 3-8. Phoenix, Arizona.
Nov. 5-12. Shreveport, Louisiana.
Nov. 22-29. Fort Worth, Texas.

Horse shows and fairs:

Nov. 15-22. New York.
Nov. 24-29. Fort Worth, Texas.
Dec. 1-6. Chicago.

1132 – Agricultural Congresses.

United States of America.

1913. Oct. 22.-Nov. 1. Tulsa (Oklahoma). — Eighth International Dry-Farming Congress. Applications for the report (costing one dollar) should be addressed to: Sir John Burns, Executive Secretary-Treasurer, International Dry-Farming Congress, Tulsa, Oklahoma.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1133 - **On the Circulation of Sulphur and of Chlorine on the Earth, and on the Importance of this Process in the Evolution of Soils and in the Vegetable World.** — Kossovitch, P. (Bureau for Agricultural Science of the Scientific Committee of the Central Administration for the Organization of the Land and of Agriculture). in *Russisches Journal für Experimentelle Landwirtschaft*, Vol. XIV, No. 3, p. 181. German Edition, p. 218. St. Petersburg, 1913.

The writer treats specially the following subjects:

I. The chlorine and sulphur contents of rocks and soils

II. The quantities of chlorine and sulphur which are brought to the surface of the earth and to the soil by atmospheric precipitations.

III. The quantities of chlorine and sulphur that are washed out of the soil by subsoil waters.

IV. Part played by the chlorine and sulphur conveyed by the atmosphere in the evolution of the soil.

V. Chlorine and sulphur content and requirements of plants.

VI. General considerations on the circulation of chlorine and sulphur in nature.

Chapter I. — *The chlorine and sulphur contents of rocks and soils.*

On the basis of analytical data, mostly taken from the existing literature on the subject, the writer comes to the following conclusions:

1) *Crystalline eruptive rocks* rarely contain more than 0.1 per cent of chlorine; the most widely spread rocks generally contain still less, mostly only traces. The amount of sulphur in the same rocks is higher than that of chlorine and often exceeds 0.1 per cent.

2) *In clastic and sedimentary rocks* chlorine in slightly soluble form is completely lacking; it is present only in the form of easily soluble salts, generally in traces.

3) *In soils*, chlorine in slightly soluble forms is not present; the traces that have been observed are due to easily soluble salts. Sulphur is present in the soil in certain quantities in slightly soluble form, but they are not large; according to available data, the total amount of sulphur in the soil is found in the humous layer, and is 0.04 per cent. corresponding to 0.1 per cent. of SO_3; in soils rich in humus, such as the Chernoziom, it reaches 0.1 per cent. The sulphur contents of the soil decrease considerably with the depth.

Chapter II. — *Chlorine and sulphur in atmospheric precipitations.*

On the strength of material collected in eight localities of European Russia and of the data available for other countries, which are chiefly taken from N. H. J. Miller's treatise "The amounts of nitrogen as ammonia and as nitric acid, and of chlorine in the rain-water collected at Rothamsted" (*The Journal of Agricultural Science*, Vol. 1, Part 3), the writer believes himself justified in drawing the following conclusions.

A. *For Chlorine.*

1) The chlorine content of the several atmospheric precipitations varies in different parts of the world and within very wide limits: from 0.4 to 71.9 per million. In the analyses made for Russia the lowest chlorine content found in one determination was 0.42 per million (Shatilov Experiment Station), the highest 58.11 (Borovoje Forest Experiment Station).

2) The yearly averages of the chlorine content of atmospheric precipitations varies in the different parts of the world within much narrower limits: from 1.46 per million (Konstatinov Meteorological Observatory in the neighbourhood of St. Petersburg) to 9.72 (Island of Ceylon), when Guardia in Spain is not considered, in which locality the exceptionally high figure of 31.20 has been recorded. For the localities in Russia which have been examined the differences are still smaller, the lowest chlorine content (Konstantinov Observatory) being 1.46 and the highest (Borovoje) 4.00. In general it may be assumed that the atmospheric precipitation of the interior of Russia ranges in chlorine content between 2 and 3 per million.

3) The amount of chlorine contained in the atmospheric precipitation depends chiefly on the position of the locality with regard to the seas and oceans; on approaching the latter the amount of chlorine increases. Also in regions which border on salt lands the precipitations may be richer in chlorine. Generally slight precipitations contain more chlorine than the heavier ones.

4) The quantities of chlorine which fall in one year with the atmospheric precipitations per unit of area vary also very considerably in the various parts of the world. According to available data the lowest quantity of chlorine was observed at the Konstantinov Observatory, namely 7.09 lbs. per acre; the highest at Guardia in Spain, 399.5 lbs. per acre. But the yearly accession of chlorine in most territories varies between 8.92 and 22.30 lbs. per acre. Among the Russian localities examined the first place belongs in this respect to the Forest Institute (near St. Petersburg) where each acre received 14.98 lbs. of chlorine.

B. *Sulphuric Acid.*

1) The lowest content in sulphuric acid per million parts of atmospheric precipitation sank in the single determinations lower than the chlorine content, namely to 0.28 of SO_3 (Sapolje Experiment Station). The maximum was 90.2 of SO_3 at the Forest Experiment Station at Marinpol.

The *yearly average* of sulphuric acid in the precipitation in the Russian territories that were investigated was 1.93 (Shatilov Experiment Station) and the highest 14.17 (Mariupol Forest Experiment Station). At localities within the area of influence of large cities, factories, railaways, etc., the amount of sulphuric acid contained in the atmospheric precipitations has been determined by the writer to be above 10 parts per million, while in the country it varies between 2 and 3.

2) The quantities of sulphuric acid per unit of area which fall to the ground with the precipitations vary considerably in the localities examined. Places

which are not under the influence of chimney smoke get yearly about 8.92 lbs of SO_3 per year. In the neighbourhood of towns and industrial works the yearly amount reaches almost 72 lbs. In such localities the greatest portion of the sulphuric acid falls in winter. Thus, for instance, at the Forest Institute one-third falls during the summer half-year and two-thirds during the winter half. Localities in the country do not show much differences in the quantities that fall during the various seasons.

Chapter III. — *The quantities of chlorine and sulphur contained in subsoil waters.*

On the basis of theoretical speculations the writer gives the following characters of subsoil water:

1) The percentage of chlorine and sulphur in the water in the soil and subsoil is in general higher than that in atmospheric precipitations.

The general and fundamental cause of this greater percentage is the evaporation, both directly from the soil and through vegetation, of a part of the water received as atmospheric precipitation.

2) As the ratio between the water that penetrates into the soil from the atmosphere and that which evaporates varies between wide limits, so do the relative chlorine and sulphur contents of soil and subsoil water vary greatly. In special cases these contents increase owing to a whole series of concurring causes.

3) The percentage of chlorine and sulphur in the soil water of any locality may, under certain conditions and when the amounts of these elements contained in the atmospheric precipitations are known, furnish data by means of which the evaporation of water from the soil or the relative quantities of soil water that are formed, may be determined.

4) The chlorine and sulphur content of the water in the soil varies not only with the locality, but from year to year and from season to season, and changes in the course of years.

Chapter IV — *Part played by the chlorine and sulphur, which are conveyed by atmospheric precipitations, in the evolution of the soil.*

The writer considers exhaustively the two following questions: firstly, what length of time is necessary for the chlorine and sulphur of the atmosphere to transform a soil into a salt soil when there is no formation of subsoil water; secondly what is the least quantity of subsoil water necessary in order to carry away all the chlorine and sulphur introduced from the atmosphere. At the conclusion of the chapter the writer formulates the following propositions:

1) As primitive rocks contain only small quantities of chlorine and sulphur, and these in the processes of weathering and soil forming are easily transformed into soluble compounds and rapidly leached out, the natural

consequence would be a relatively rapid impoverishment of the soil in these two elements, until their complete disappearance took place. As further the development of plants is impossible in the absence of sulphur, so is a continuous introduction of sulphur from the atmosphere a necessary condition for vegetation and for the evolution of the soil.

2) In soils and subsoils in which, in connection with a dry climate, underground waters are not formed, an accumulation of sulphur and chlorine due to atmospheric precipitation must take place. If it be assumed as an approximation that the soil receives from the atmosphere only 4.46 lbs. of chlorine and 4.46 lbs. of SO_3 per annum (which corresponds to about one-half of the smallest amounts of these substances which are received per acre and per annum), the author calculates that it would take 12000 years to collect 0.5 per cent. of each of these substances in a layer 3ft. 3 in. deep; in this case it would be a decidedly salt soil which would contain about 1 per cent. of chlorine and sulphur compounds But to render a soil too salty for most cultivated crops, which it becomes when it contains 0.05 per cent. of chlorine, 1200 years would be sufficient, and these from a geological point of view constitute but a brief period.

3) If, on the contrary, there is formation of subsoil waters, it requires great quantities of them to leach out completely the chlorine and sulphur compounds conveyed to the soil by atmospheric precipitations. Thus the quantities assumed above, namely 4.46 lbs. of chlorine and the same of SO_3 would require about 720 cub. ft. of water per acre to leach them out as a 0.01 per cent. solution, which would be equal to a layer of water of about 0.2 inches; consequently the formation of a relatively insignificant quantity of subsoil water is sufficient to prevent an accumulation of chlorine and sulphur compoumds in the soil.

CHAPTER V. — *Quantities of chlorine and sulphur contained in and required by plants.*

The writer discusses these points principally in connection with sulphur. On the strength of the available Russian and North American analyses the following conclusions are arrived at:

1) Determinations of sulphur content carried out with all due precautions on the plants themselves, not on the ash, show that cultivated crops are relatively rich in this element: in some of them, such as cabbage, turnips and onions, the sulphur content is higher than the content in phosphorus. In other plants, for instance red clover, lucerne and sugar beets the two elements are present in equal quantities; cereals especially are poor in sulphur, containing about twice as much phosphorus as sulphur.

2) According to the above data, the sulphur content, expressed as SO_3 and referred to air dry matter, ranges in the grain of cereals from 0.29 to 0.45 per cent.. in straw between 0.26 and 0.55 per cent. Clover hay contains 0.41 per cent. of SO_3, lucerne hay 0.50 per cent. Peas contain 45 per cent. beans (*Phaseolus*) 0.58 and soy beans 0.85. In some crucifers the sulphur

content exceeds 1 per cent.: in turnips it is 1.85 and in cabbage 2.05 per cent. of SO_3.

3) The quantities of sulphur which are removed by average crops from an acre maynbe expressed by the following figures: for cereals 6.25 to 8.92 lbs, of SO_3 (in crop of 1338 lbs. of grain and 1962 lbs. of straw per acre); for red clover 16.06 lbs. (4014 lbs, of hay); for lucerne 26.76 lbs. (53.52 lbs. of hay); sugar beets about 44.6 lbs and cabbage 65.13 lbs. (in a crop of 3212 lbs).

4) The sulphur derived from atmospheric precipitationsis sufficient to satisfy the wants of relatively abundant crops of cereals only, but on condition that there be no leaching out of sulphur; for if there is any such loss, the cultivation of such plants unless accompanied by appropriate manuring will gradually lead to a shortage of sulphur and the crops will diminish until an equilibrium gets established bewoeen the sulphur brought by the atmosphere and that taken up by the plants and leached out by subsoil water.

5) On the other hand, in localities situated near towns and industrial centres, the wants of such plants as are most exacting in their sulphur requirements can be completely satisfied by the quantities furnished by the atmosphere. In making and judging experiments on the requirements of sulphur in the soil the above mentioned great differences in the amounts of sulphur given up by the atmosphere according to locality must be taken into account. This especially in treating the question of soil sickness in connection with clover and in dressing clover with gypsum.

6) The reserves of sulphur in the soil cannot be considered as being large in comparison with the requirements of plants as to this element. An average sulphur content of the soil (in the upper layer one foot deep 0.1 per cent. SO_3, in the next 2 ft. 3 in. 0.025 per cent.) amounts to about 5085 lbs. per acre in a layer 3ft 3 in. deep; one half of this amount corresponds to 285 cereal crops or 70 lucerne crops.

All the preceding data and considerations show that in certain cases an impoverishment of the soil as to sulphur and a shortage of this element for the nutrition of plants is possible, and consequently that sometimes for a succession of heavy crops the introduction of sulphur by means of suitable manuring becomes necessary.

CHAPTER IV. — *General considerations. On the circulation of chlorine and sulphur on the globe.*

It is specially emphasized that at present the circulation of chlorine consists chiefly in a mechanical transport between the land, the seas, and the atmosphere, and in the form of that simple combination in which chlorine is prevalently found.

The circulation of sulphur is considerably more complicated: on the one hand sulphur is subject to a continuous passing from an inorganic to an organic form and vice-versa, on the other it undergoes oxidation and reduction processes in most of which micro-organisms take part.

1134 – The Condition of Soil Phosphoric Acid Insoluble in Hydrochloric Acid. —

FRY, W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Department of Agriculture), in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 8, pp. 664-665. Easton, Pa., August 1913.

The official method for the analysis of soils is accomplished by digesting a known quantity (10 grams) of the soil in hydrochloric acid, specific gravity 1.115, for ten hours on a steam or water bath, and then analysing the solution thus obtained for the constituents which it is desired to determine. This method does not invariably give the total amount of phosphoric acid present in the soil analysed. The writer gives the values obtained in the study of the chemical composition of Maryland soils ; the average percentage of phosphoric acid extracted was about 57.6 per cent. In the same manner a series of Virginia soils, in every case except one, gave less amounts of phosphoric acid than the total amount obtained by the fusion method.

There are two explanations for this :

a) The phosphoric acid not extracted by the official method is present in the soil in compounds insoluble in the acid used.

b) It is present in a soluble from which it is protected from the action of the acid.

We have no means of directly testing the first of these possibilities. Several mineral phosphates have, however, been found which their finders state are insoluble in hydrochloric acid. None of these insoluble phosphates however have been discovered in the soils examined by the Soil Bureau ; if they do exist in them the quantity present must be extremely small. Further the amount of insoluble phosphoric acid present in minerals which do not carry the former as an essential ingredient, or which is present in other forms derived from the interaction in the soil solution, must be very small indeed.

In regard to the second possible explanation, mineralogical analyses have shown that a very large number of soils contain apatite, a hydrochloric acid-soluble calcium phosphate, enclosed in quartz grains. Such soils were subjected to acid digestion, and the apatite was found still inclosed in quartz, and apparently unattacked.

In conclusion, it may be said that possibly a very minute quantity of phosphoric acid is present in soils in compounds which are insoluble in hydrochloric acid, but a large part of the phosphoric acid not extracted is present in a soluble form, *i. e.*, as apatite, which is protected from the action of the acid.

1135 – The Question of the Inoculation of New Crops on Moor Soil. —

RAMM, E. in *Illustrierte Landwirtshaftliche Zeitung*, Year 33, No, 66, p. 597, 1 fig. Berlin, August 16, 1913.

The inoculation of new crops on moor (1) soil, whether by means of inoculated soil or of pure cultures, is a matter of much difficulty when it is a question of thus treating hundreds of acres. For this reason, attempts have for many years been made on the State farm in the Wiesmoor to substitute a dressing of nitrate of soda (180 lbs. per acre) for inoculation. The attempt has been most successful: the crops grew well right from the start and developed in a thoroughly satisfactory manner.

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(1) We translate the German "Hochmoor" as "moor", and "Niedermoor" as "fen"; cf. TANSLEY : "Types of British Vegetation", pp. 208-213.

(*Ed.*)

From this time, all new crops in the Wiesmoor have been thus prepared; the results have been uniformly successful and no interruptions in the cultivation operations have occurred. In 8 to 14 days after germination, the roots of the clovers and other Leguminous plants show plenty of nitrogenous nodules.

On areas which have not been inoculated or manured with nitrate, the root nodules do not make their appearance until much later, generally not until about eight weeks have elapsed. Further, the crop, as a rule, shows gaps which only fill up after some time.

It should be the task of science to ascertain the source of the bacteria, which, on the application of nitrogenous manure, produce such a general and regular crop of nodules on the roots, and to account for the increased bacterial receptivity possessed by plants with nitrogenous manuring.

The practical results of the experiments on the Wiesmoor show that where new crops must be sown throughout the spring and summer, a nitrogenous manure is less troublesome and much more certain in its effects than inoculation; thus the application of easily soluble nitrogen is preferable from an economic stand-point. With a nitrogenous manure, the success of the newly-sown crops can be more surely reckoned upon, while there are more failures in the case of inoculation. The areas receiving the nitrogenous manure develop so well that the cost of the fertilizer is paid by turning the sowing year to account. If the greater certainty is taken into consideration, a nitrogenous manure is also cheaper than inoculation. Further experiments should show how far the above-mentioned results are affected by the application of nitrate of soda in larger or smaller amounts than the 180 lbs. per acre employed in this case.

1136 – **Experiments on Denitrification.** — TCHIRIKOV TH. and SCHOAUCK, A. in *Isviestia Moskovskago Selskokhosiaistvennago Instituta*, Year XIX, Part 2, pp. 270-285 + figs. Moscow, 1913.

Three series of experiments on denitrification conducted at the Agronomic Institute at Moscow.

I. *Influence of moisture on the course of denitrification in the presence of straw in progressive doses.* — Experiments carried out in sandy loam soils at different degrees of moisture: 40, 60, 80 per cent. of the water capacity of the soil. The results obtained were the following:

1. Oats both without strawand in doses of 0.25 to 1 per cent. of the soil in pots, developed best with 80 per cent. of moisture.

2. A diminution in the yield of oats was observed with increasing doses of straw and this with various degrees of moisture.

3. This diminution of yield took place more rapidly with 80 per cent. of moisture; with less moisture it was less intense.

4. In general an increase in the degree of moisture favours the depressing influence of the straw both on nitrate of soda and on sulphate of ammonia.

5. The decrease of yield caused by the application of 0.25 per cent. of straw is equivalent to that caused by a reduction of the degree of moisture to 20 per cent.

II. *Addition of carbonate of lime in the presence of straw.* — The addition of carbonate of lime diminishes the depressing effects of straw considerably if not completely. The favourable effects of carbonate of lime are already noticeable with a dose of 0.25 per cent. of the earth; but on increasing the dose to 1 per cent. there was no further increase of yield.

III. *Action of sugar starch and straw.* — Experiments of cultivation in sand with additions of sugar, starch and straw, in doses of $^1/_8$ to 1 per cent. of the sand. The plants grown (oats and mustard) developed least with sugar, next came starch and straw. As for the balance of nitrogen the writers make the following principal observations:

1. The depressing action on plants caused by the addition of the above mentioned substances is not due to a real denitrification.

2. The nitric nitrogen of the soil gets converted into albuminoid bodies, thus depriving the plants of a considerable part of the assimilable nitrogen.

3. The percentage of nitrogen in plants is the greater the more their development is depressed.

4. The addition of organic substances in the presence of nitrates causes the production of an alkaline medium and in direct ratio to the quantities employed.

1137 - **Irrigation Resources in California and their Utilization.** — ADAMS, F. (under the direction of FORTIER. S.) — *U. S. Department of Agriculture, Office of Experiment Stations, Bulletin* 254, pp. 95, 9 maps. Washington, June 1913.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

For many years the United States Geological Survey has been mapping topography, measuring streams, and studying underground waters in California, and engineers of the Reclamation Service have been looking for possible developments of unreclaimed land. In 1910 the Office of Experiment Stations directed an irrigation census of California, and in 1912 the Conservation Commission of California published three full reports dealing with Northern, Central, and Southern California respectively and the irrigable area of each section, together with discussions of water supplies, their present use, and estimates of future possibilities. The present Bulletin summarises these and records the results of a further series of field investigations made by the Office of Experiment Stations in cooperation with the Conservation Commission during the year 1912.

Irrigation is not equally necessary in all parts of California, neither can the necessity for it be predicted from the annual rainfall. If grain were the only crop grown, but little irrigation would be required in the coastal or in some of the interior valleys of the northern half of the State. Below San Francisco the necessity would increase, becoming absolute in the lower San Joaquin Valley and most of the State south of Tehachapi. But even in the northern part of the State the rainfall occurs almost entirely during the winter, which is the growing period, and during the rainless summer few plants can be grown without an artificial water supply, so that irrigation during the latter season is a distinct advantage in nearly every section of the State.

Northern California, or that portion of the State north of San Francisco, is divided into six irrigation zones: the coastal zone, the mountain valleys to the north, the mountain valleys to the east, a zone of high plateaus and valleys in the north-eastern corner of the State, the Sierra foothills on the western slope of the Sierra range, and the Sacramento Valley. The present extent of irrigated land and possible future developments are estimated as follows.

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Coastal counties	502 200	2 675	100 000
North-central mountain valleys.	435 000	103 850	250 000
North-eastern plateaus and valleys	867 000	161 930	300 000
Feather River valleys (mountain valleys) .	158 000	50 600	100 000
Sierra foothills	789 000	45 250	200 000
Sacramento valley	3 449 000	123 500	2 500 000
Total . . .	6 200 200	487 805	3 450 000
	100	7.9	55.6

In a general way it may be said that the irrigated land in Northern California forms but a small percentage of the agricultural land and enjoys a very abundant water supply which is used in a wasteful fashion. If used to the best advantage and with suitable storage, etc., the water resources of this section should be sufficient to increase the irrigated area from 7.9 to 55.6 per cent. of the agricultural land.

Central California, or that part of the State south of San Francisco and north of Tehachapi, is divided into four irrigation zones: the coastal valley, the large central valley of San Joaquin, the Sierra foothills on the wetern slope of the Sierra range and a high zone east of the Sierra range. The agricultural areas irrigated at present or liable to future development are as follows:

	Agricultural land	Irrigated at present	Total area to be eventually irrigated
	acres	acres	acres
Coastal Valley	887 000	82 000	200 000
San Joaquin Valley	7 576 000	1 728 975	3 850 000
Sierra foothills	730 000	10 620	50 000
Zone east of the Sierra	472 000	137 760	200 000
Total . . .	9 665 000	1 959 355	4 300 000
	100	20.3	44.5

In the coastal valley the water is not abundant and is further reduced by the fact that the cities take a heavy toll. Already, one-third of the water used there for irrigation is pumped, and as valuable crops can be grown when water is available, considerable expense may be incurred in order to obtain it. On the whole, good use is made of the water supplies in Central California, and future development will only take place by practising the strictest water economy and, in the case of the coastal valley, by utilizing the underground resources. In the high zone east of the Sierra Nevada the available water supply will be tapped by the Los Angeles aqueduct, now under construction, which will divert 430 cubic feet per second for use in and about Los Angeles.

Southern California, or that part of the State south of Santa Barbara and the Tehachapi Mountains, is divided into six irrigation zones, four of which are more or less coastal, the two others being the Colorado and Mojave deserts:

With regard to the coastal zones, Santa Barbara and Ventura Counties have not, up to the present, utilized their water resources as completely as other parts of Southern California, and the surface flow together with underground supplies might serve to increase the irrigated area 6 ½ times. Development in the Los Angeles and San Gabriel River zone will depend largely on the Los Angeles aqueduct, and in the two other coastal zones no great developments are likely to take place, as the supplies are already well utilized. In the desert zones, the luxuriance of plant growth under irrigation is inevitably bringing about development, though the water resources are limited. Increased supplies will come in part from the Colorado River and in part from underground supplies.

Summarising: " The total area of irrigable land found in the zones of irrigation water supplies, which includes all of the valley lands, the rolling plains of the Great Valley, the arable portions of the Sierra foothills up to about 3000 feet in elevation, and all of the plateau and desert lands to which

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Santa Barbara and Ventura Counties . . .	509 250	49 656	322 500
Los Angeles and San Gabriel River lands.	441 986	167 454	381 500
Santa Anna River lands	876 671	213 407	279 000
San Diego County	363 668	19 880	87 100
Colorado Desert and River Valleys	1 550 750	279 600	766 500
Mojave Desert	2 328 000	15 489	113 000
Total . . .	6 070 325	745 486	1 949 600
	100	12.3	32

some irrigation water supplies are available, is 21 935 500 acres, of which 3 192 646 acres are already irrigated, and 9 699 600 acres are estimated as the area to be ultimately irrigated. "

The writer states that the results given above are largely statistical, so that the estimates of areas ultimately to be irrigated can only be very approximative. The 1912 investigation dealt chiefly with a detailed study of six typical irrigated areas which are fully described in the Bulletin. The writer repeatedly urges the absolute necessity of a general State control of all water supplies, for in that manner only can they be put to the best use and lead to a maximum development of agriculture in California.

1138 – **The Murrumbidgee Irrigation Scheme in New South Wales.** — *Journal of the Royal Society of Arts*, Vol. LXI, No. 3168, pp. 873-875. London, August 8, 1913.

The soil of the so-called "chocolate" lands in the western part of New South Wales is extremely fertile, but up to the present owing to insufficient rainfall, the land has only been used for grazing sheep and cattle. As the outcome of the work of a Royal Commission, appointed thirty years ago, the State Government has begun work on a gigantic irrigation scheme in the Murrumbidgee River basin.

The waters of the Murrumbidgee are derived from the lofty table lands in the Eastern part of the colony where the rainfall amounts to from 20 to 70 in. per annum; the chief gathering ground is a basin 5 000 sq. miles in extent with only one outlet to the lower country through a deep gorge at a place called Barrinjuick. With a suitable dam here the most perfect natural reservoir is obtained, backing up the river for 41 miles and two important tributaries for 15 and 20 miles respectively, and forming a lake with an area of 29 square miles. "The dam is of Cyclopean concrete, 240 ft. high at its maximum section, and 18ft. wide at the top. The up-stream face is nearly vertical, being slightly battened down to the base. The down-stream face shows a curve concave to the down-stream to 60 ft. below the crest, so as to make the dam 36 ft. thick at that point. Then there is a slope of 1 ½ to 1 for a depth of 90 ft., at which point the dam is 90 ft. thick Then follows another curve in the same direction, for 50 ft. vertical, to a level 40 ft. above the base. From this point the face is vertical, and finishes at 176 ft. from the inner toe of the foundation. In plan the dam will be 784 ft. in length along the crest, which is curved convex to up-stream to a radius of 1200 ft. The wall is being built up in a series of units, each representing the average quantity of concrete that can be placed in one day These units break joint in every direction, so as to imitate masonry construction and minimise defects due to remission of work."

The outlets consist of four 4 ft. 6 in. pipes, passing through the dam near the foundation, and controlled by valves, and two byewashes at the top, one at each side of the dam. The sides and bed of the gorge are of granite, and blocks of this are used for the concrete ; sand is also obtained near by. The granite floor is irregular, so that the concrete masses key into the holes, thus preventing any possible movement under the pressure of the water.

The estimated cost of the dam, notwithstanding the high price of the labour, comes to about £ 750 000, which is roughly equivalent to £1 per acre-foot of water held back ; this is believed to be much less than the cost of any similar work elsewhere ; the Assuan dam, which holds up a maximum depth of 75 ft. of water, as against 230 ft. at Burrinjuick, cost £2 7s. per acre foot of stored water.

For 220 miles below Burrinjuick irrigation is not required ; then a rocky dike at Berembed, near Narandera, forms a convenient point for the diversion of the river. The main irrigation channel is 132 miles long and has a 34-mile branch, as well as distributing channels, and will serve to irrigate a block of land of 1 300 000 acres. At the point of diversion, a flow of 2 000 cubic feet of water per second will be available. The main irrigation canal is 64ft. wide at the water-level with a flow 8ft. deep, equal to a present discharge of 1000 cubic ft. per second ; this capacity will eventually be doubled. Distributing canals carry the water to each separate holding. Most of the farms on the area are designed for mixed farming and comprise 50 acres of irrigable land. Some, however, are smaller, while horticultural and workmen's blocks are narrowed down to 10 and 2 acres respectively.

The irrigation settlement will include three towns, about 400 miles away from Sydney. These will be planned on modern lines, and will be provided with factories for the utilization of the produce. Roads will be arranged in such a way that no landowner will be more than a mile and a half from one.

The soils in the Murrumbidgee Valley are suited for irrigation, being loamy, deep, rich and friable. The natural drainage is such as to preclude any necessity for an artificial system. Analyses show that the soils contain an exceptional proportion of potash, and nodular limestone is abundant. The soil displays great bacteriological activity with rapid and vigorous nitrification. Mineral plant food is abundantly present.

All the land within the irrigation area is leasehold, and the lessees have to conform to conditions and regulations that are more or less inseparable from an undertaking that needs more co-operation than among the settlers in more ordinary circumstances. The conditions to be fulfilled are perpetual residence, payment of rent and balance of survey fees, and for value of improvements, if any, on the land when applied for. The rent is at the rate of 2 ½ per cent. per annum on the capital value. Farms are not transferable, with certain exceptions, until 5 years' residence has been completed.

As to the cost of water to the settler, it is fixed at 5*s* per acre-foot during the summer ; this water rate is to be reduced by one half during the settler's first year of occupation, then increasing uniformly until the sixth year, when the 5*s* rate is required. The operations of farming on the area have now fairly started, and a certain amount of produce has been sent away to market.

The cost of the present scheme in round figures is approximately as follows : main works, £ 1 650 000 ; subsidiary channels, £650 0000 ; cost of land, £ 1 000 000 ; total cost £ 3 300 000.

MANURES AND MANURING

1139 – **Comparative Manuring Experiments with Crushed Phonolite and 40 per cent. Potash Salts.** — WAGNER, F. Düngungsversuche des Deutschen Hopfbauvereins mit Phonolithmehl (Kalisilikat) in Vergleich zu 40 % igem Kalisalz in den Jahren 1910-1912. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Parts 4, 5, 6, pp. 52-53, 67-70, 77-82. Stuttgart, April-May-June 1913.

An account of three year experiments (1910-11-12) carried out at Geisenfeld, Bavaria, by the German Hop-Growers' Association ("Deutsches Hopfenbauverein") at Geisenfeld, Bavaria. The hop garden which was the site of the experiments was planted in 1908; the soil was humous sand (83.4 per cent. of fine soil), infertile and poor in potash (0.107 per cent. K_2O in air-dried fine soil). To a basis of sulphate of ammonia, basic slag and lime were added, for comparative purposes, the crushed phonolite prepared by the "Westdeutsche Eisenbahngesellschaft, Köln, Abteilung Steinbrüche, Brohl am Rhein", and 40 per cent. potash salts. The crops of 1910 and 1911 were failures owing to reasons unconnected with the experiment.

In 1912 the experiments were recommenced on eighteen plots; in twelve there were 4 rows of 20 hills, and in six there were 4 rows of 10 hills. Each hill, received 100 gms. (3 ½ oz.) of sulphate of ammonia, 150 gms. (5 oz.) of basic slag (at 18 per cent. P_2O_5), and 100 gms. (3 ½ oz.) of lime as a top dressing. The potash manure was applied as follows.

Plots 1, 7, 13: 284 gms. of phonolite at 9.87 per cent. potash = 28 gms. K_2O
» 2, 8, 14: without potash —
» 3, 9, 15: 60 gms. potash salts at 46.84 per cent. potash = 28 gms. »
» 4, 10, 16: 142 gms. of phonolite = 14 » »
» 5, 11, 17: without potash —
» 6, 12, 18: 30 gms. of potash salts = 14 » »

Reduced to acres, the results obtained in 1912 are from the financial point of view as shown in Table I.

TABLE I.

Amount of potash	Increase in crop due to the potash manure	Profit (hops at 74s 6d per cwt.)		Cost of manure and of picking and drying extra crop		Net profit due to the potash manure	
	cwt.	£	s	£	s	£	s
129 lbs. as potash salts (2 oz. per hill) at 2s 9d per unit.	6.1	22	14	8	2	14	12
64 lbs. *id.* (1 oz. per hill) *id.*	3.7	13	17	4	17	9	0
129 lbs. as phonolite (10 oz. per hill) at 5s per unit.	2.0	7	6	3	4	4	2
64 lbs. *id.* (5 oz. per hill) *id.*	0.7	2	15	1	6	1	9

The data respecting the quality of the hops in 1912 are given in Table II.

TABLE II.

Potash manure	Points for appearance, lupulin and aroma (3—15)	Commercial value	
		relative (minimum = 100)	absolute (per cwt.)
129 lbs. of potash as phonolite	9.25	101.0	105s
» » » potash salt	9.75	102.5	106s 6d
64 » » phonolite	9.00	101.5	106s 6d
» » » potash salt	10.00	105.0	109s
None	9.75	104.3	109s

1140 – **The Sulphur Industry and Trade in the United States.** — PHALEN, W. C. (U. S. Geological Survey) Sulphur Pyrite and Sulphuric Acid. — *The American Fertilizer*, Vol. XXXIX, No. 3, pp. 41-56 (41-47) Philadelphia, August 9, 1913.

The production of sulphur in the United States since 1880 is shown in the following table.

Production of sulphur in the United States, 1880-1912 *in long tons.*

Year	Quantity	Value $
1880	536	21 000
1881	536	21 000
1882	536	21 000
1883	893	27 000
1884	446	12 000
1885	638	17 875
1886	2 232	75 000
1887	2 679	100 000
1888	—	—
1889	402	7 850
1890	—	—
1891	1 071	39 600
1892	2 400	80 640
1893	1 071	42 000
1894	446	20 000
1895	1 607	42 000
1896	4 696	87 200
1897	2 031	45 590
1898	1 071	32 960
1899	4 313	107 500
1900	3 147	88 100
1901	241 691*	1 257 879
1902	207 874*	947 089
1903	233 127*	1 109 818
1904	127 292	2 663 760
1905	181 677	3 706 560
1906	294 153	5 096 678
1907	293 106	5 142 850
1908	369 444	6 668 215
1909	239 312	4 432 066
1910	255 534	4 605 112
1911	265 664	4 787 049
1912	303 472	5 256 422

* Including the production of pyrite.

In determining the value of most of the sulphur produced in 1912, the current market price in New York was taken and the mine values were computed from it. Prices remained fairly constant throughout the year at $ 22 to 22.50 per long ton for prime Louisiana sulphur.

Quotations on other sulphur per 100 *lbs.*

	$		$
Rolled sulphur	1.85	to	2.15
Flour »	2.00	»	2.40
Sublimed »	2.20	»	2.60

Sulphur was produced chiefly in Louisiana, and in smaller quantities in Nevada and Wyoming in 1912. The production of the individual States cannot be given without divulging confidential information. Utah, which has produced on a small scale in previous years, reported no output in 1912.

Trade. Imports and Exports. — The imports of sulphur during the last five years are shown in the following table:

Sulphur imported and entered for consumption in the United States from 1908 *to* 1912, *in long tons*

Year	Crude		Flowers of sulphur		Refined		All other		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		$		$		$		$	$
1908 . . .	19 620	318 577	793	22 562	693	17 227	30	4 013	362 379
1909 . . .	28 800	492 962	770	23 084	966	26 021	53	7 565	549 632
1910 . . .	28 656	496 073	1 024	30 180	1 106	25 869	47	6 489	558 611
1911 . . .	24 200	434 796	3 891	83 491	985	24 906	68	9 643	552 836
1912 . . .	26 885	494 778	1 311	39 126	1 665	40 933	66	9 137	583 974

Crude sulphur imported from the following countries, from 1910 *to* 1912, *in long tons.*

Countries whence exported	1910		1911		1912	
	Quantity	Value	Quantity	Value	Quantity	Value
		$		$		$
Canada.	5	160	—	—	—	—
United Kingdom	7	199	11	248	—	—
Italy.	10 704	201 993	8 031	156 157	2 348	46 003
Japan	17 377	283 232	16 185	279 991	24 505	447 946
Other countries	554	10 404	23	329	32	829

The exports during the last three years were as follows:

Total exports of sulphur from the United States from 1910 to 1912, in long tons.

Year	Quantity	Value
		$
1910	30 742	552 941
1911	28 103	545 420
1912	57 736	1 076 414

It is to be noted that in 1910 the sulphur production of the United States amounted to 3147 tons; the imports during that year were 167 696 tons, of which 166 285 were crude sulphur chiefly from Sicily. Thus the domestic production amounted to 1.84 per cent. of the sulphur consumed during that year, while in 1912 against a domestic production of 303 472 tons the imports amounted only to 29 927 tons, the domestic production constituting 91 per cent. of the consumption, and the imports less than 9 per cent. Moreover in the same year the excess of exports over imports amounted to 27 809 tons and the balance of trade in favour of the United States was $ 492 440. The imports from Italy were only 8.7 per cent. of the total, while those from Japan amounted to 91 per cent. For the year 1912 it is estimated that the output of that country cannot be far from 40 000 tons, and it is believed that with the completion of the Panama Canal, United States sulphur may practically displace foreign sulphur on the Pacific Coast (California, etc.).

Further development. — Some new factors of the American sulphur industry are the foreign expansion of the Union Sulphur Co. of Louisiana and the new sulphur mines in Texas and in Wyoming.

The Union Sulphur Co. is reported to have negotiated with the city authorities of Rotterdam (Holland) for the leasing for twenty-five years of a suitable tract of land having access to one of the harbours upon which to build a sulphur mill and other buildings. The city has offered a tract of land 330 × 420 feet with dock facilities on the Maas Haen, for which an annual rental of $ 4200 is asked. The firm contemplates making Rotterdam its headquarters in Europe, and already a new refinery with grinding and storage facilities is being built. During 1912 the company is stated to have acquired storage facilities at Hamburg (Germany). Besides these recent additions to its European distributing centres the company has refineries and storage plants at Marseilles and Cette in France. These plants will be supplied by the company's own fleet of ships, to which two vessels were added in 1912.

In 1909 and 1911 the occurrence of suphur near Bryan Heights at the mouth of Brazos River, in Brazoria County, Texas, was reported. Actual mining operations however were not begun till November 1912 by the Freeport Sulphur Co. The work has been somewhat intermittent owing to difficulties inherent in the beginning of an operation of this kind.

The sulphur is to be obtained by a process similar to that employed in Louisiana, that is the sulphur is melted in the ground by superheated water and is pumped to the surface by an air lift. Up to the middle of February 1913 seven wells had been sunk.

Bryan Heights is well located for the exploitation of the sulphur. It is only 3½ miles from the Freeport harbour. The detailed results of the drilling operations have not yet been published, but it is reported that the sulphur deposit was found at a depth varying between 900 aud 1100 feet. The sulphur beds themselves ranged in thickness from a few inches up to 7 feet. Fuel oil will be used in the machines for raising the sulphur and the oil can be delivered at Freeport at a low cost.

Other sulphur deposits have been found in Wyoming, but it is still doubtful whether they can be utilized unless the local demand becomes great.

Lastly the deposits of sulphur situated on White Island in the Bay of Plenty, New Zealand may, prove of interest for the markets of the Pacific. Work began on these deposits in April 1912 and the tonnage of sulphur estimated in them is very large.

AGRICULTURAL BOTANY, CHEMISTRY AND PHYSIOLOGY OF PLANTS

1141 – **Experiments on the Availability of Glucosamine Hydrochloride as a Source of Nitrogen for the Nutrition of Corn *(Zea Mays)* and Beans *(Phaseolus multiflorus).*** — HAMLIN, M. L. in *The Journal of the American Chemical Society*, Vol. XXXV, No. 8, pp 1046-1049. Easton, Pa., August 1913.

Two sets of experiments were carried out with 46 and 24 plants respectively, and showed that glucosamine could not be utilized as a source of nitrogen in plant nutrition, owing either directly to its own characteristics, or indirectly to conditions it may have caused, such as the growth of some mould which frequently appeared in the glucosamine solutions.

PLANT BREEDING

1142 – **New Selection Varieties from Alpine Forms of Fodder Grasses.** — VON WEINZIERL, TH. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 790-820, 2 figs., 10 plates. Vienna, July 1913.

I. INFLUENCE OF THE ALPINE CLIMATE ON PASTURE GRASSES.

Specific alpine plants show a number of the most varied and characteristic morphological and physiological modifications, which are to be attributed primarily to the effect of the alpine climate, and according to C. v. Naegeli should be regarded as "adaptation characters", in distinction to differences in organic characters which are not directly connected with adaptation to special circumstances, and are more constant.

The writer has for many years been carrying on experiments and studies on the Sandlingalp in the Northern Alps, at an altitude of 1400 m. (4700 ft.); these have shown that on the whole a number of the most valuable and important species of pasture grasses from the plains, and especially the wild forms from higher ground, when grown under alpine conditions, gradually give rise to other forms differing in morphological and physiological characters from their valley-bred ancestors. The most interesting point, and the one of greatest value from the agricultural standpoint, is that by means of continued selection, bearing on the most important characters for fodder plants (resistance to cold, yield of fodder, tillering, early development, etc.) these characters may be further intensified and prove constant under alpine conditions (sub-alpine vegetation region) even after 20 years' cultivation; in this way new varieties of these cultivated plants may be raised.

When it is also taken into consideration that many of the parent plants dating from 1891 which have undergone this gradual transformation, are still growing in the experiment garden on the Sandlingalp, it appears to the writer that his selection experiments with Gramineae may be regarded as a further and conclusive proof of the truth of the theory advanced by Lamarck and upheld by C. von Naegeli, that environment has a direct effect upon the individual plant and that modifications arising through direct environmental influence are transmissible.

The persistence and transmission of these acquired characters has certainly resulted in all the forms of Gramineae obtained by the writer through selection; party through mass selection and partly through line selection based on special forms and qualities.

The yearly increasing deviations in all the species and varieties consisted in the appearance of purple colour on the nodes, the leaf-sheaths and the flowering glumes, and then in the increasing production of sterile (leafy shoots) and enhanced tillering generally (Bestockungszahl) (1) ,larger number of leaves, increased breadth of the leaves, shortening of the internodes; also in the formation of special means of protection, as the waxy covering in cocksfoot (*Dactylis glomerata*) and *Sanguisorba dodecandra*, the reduction of serration of the leaves (*Bromus erectus* and *Deschampsia caespitosa*), and finally a reduction of the vegetative period and displacement of the phenological phases in general.

In order to ascertain as far as possible the relations of the climatic influence to these alterations in the alpine grass forms, the most important factors of the alpine, climate, *viz.* temperature, insolation, humidity of the air, rainfall, and the chemical light intensity, were observed regularly during the vegetative period, and it was found that certain direct adaptations depend partly on single and partly on combined climatic factors.

It can be affirmed now that without doubt, chemical light intensity plays a very important part among the climatic factors of alpine districts, and that it directs the formative process of certain organisms of especially variable species, at all events during the earliest stage of their development, giving the impetus to the characteristic laying down and the later shaping of the leaves and stem, that is of the sheath and blade in the one case, and the internodes in the other. The shortening of the latter leads necessarily to a more tufted habit, owing to the side shoots being thereby brought nearer to the main stem; this is shown by most Gramineae cultivated under the influence of the alpine climate.

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(1) The writer understands by this the number of sterile shoots to every culm of the individual plant. Translated lower down as " tillering value ".

II. THE MOST IMPORTANT ALPINE VARIETIES SELECTED FROM PLANTS FROM THE PLAIN.

The writer has bred the following new varieties:

1. *Agropyrum caninum* Schreb.: a variety bred from the wild form of the plain; it resembles Italian ryegrass, but is a persistent fodder grass (especially adapted for alpine green soiling mixtures and alpine meadows).

2. *Arrhenatherum elatius* Mert. et Koch: very suitable for alpine meadows: selected from wild forms.

3. *Arrhenatherum* var. *bulbosum* Koch: a variety well adapted for alpine meadows, selected from wild forms.

4. *Avena pubescens*. Huds: persistent, leafy variety, bred from wild lowland forms.

5. *Dactylis glomerata* L.: alpine form with bloom-covered leaves; descended from wild mountain plants; resistant to rain (ombrophilous).

6. *Festuca arundinacea* Schreb.: alpine form with the typical characters; cold resistant even at high altitutes; leaves soft; very productive, especially suitable for alpine meadows.

7. *Festuca pratensis* Huds.: from wild plants, coming from mountain meadows; a very productive and persistent alpine selected variety.

8. *Festuca rubra* var. *fallax* Hack.: from this tufted variety of *Festuca rubra*, an alpine form was bred with purple nodes and variegated outer pales; it has soft culms and narrow leaves, is cold-resistant and very productive.

9. *Lolium perenne* L.: a persistent alpine form with purple nodes, and keeled, purplish leaf-sheaths; selected from wild individuals growing on the mountains.

10. *Phleum medium* Brügger: a very productive alpine form adapted for meadows and pastures.

Finally we must mention a little-known fodder plant grown by the writer in his alpine experiment garden:

11. *Sanguisorba dodecandra* Mor.: from Val Ambria, Southern Switzerland; the alpine form has bloom-covered leaves and reddish-violet petioles and stems; it is a cold-resistant green crop for the Alps, especially useful mixed with the alpine form of *Agropyrum caninum*, and has a great future before it.

Special mention should be made of some species of plantain grown by the writer on the Sandlingalp and subjected to further selection on the Kragl estate during the last three years; of these the most important is *Plantago serpentina*, an excellent pasture plant of tufted growth; many varieties have arisen during cultivation at lower altitudes. These will be dealt with by the writer in a later paper.

III. BEHAVIOUR OF ALPINE FORMS (ACCLIMATISATION RACES) WHEN CULTIVATED AT LOWER ALTITUDES.

The writer has grown these alpine selection varieties under more favourable vegetative conditions, *viz*, in more sheltered and sunny spots, in order to obtain more seed than could be hoped for, especially in late ripening varieties at an altitude of over 1400 metres.

On the establishment of the Kragl farm (under the writer's direction) in 1908, selection experiments were begun by means of sowing the seed of the required alpine forms and pricking out selected plants, of at least two years of age, from the Sandlingalp garden. Kragl was instituted not merely as a modern pasture-farm for the furtherance of cattle-breeding interests, but primarily to serve in the promotion of botanical research and the seed selection of fodder plants.

The selection garden there lies some 820 m. (2700 ft.) above sea level; it was formerly a State nursery for forest trees, so that the ground was suitable for such experiments without the repeated working necessary in the case of the Sandlingalp. The composition of the soil and the manure used were the same as in the alpine experiment garden.

The following important facts are shown by the elaborate tables drawn up by the writer respecting the development through further selection of the forms obtained at Kragl, as compared with the alpine selection varieties.

1. In general, the number of culms per individual is considerably higher in the varieties which have been further cultivated than in the parent alpine forms, while the number of leafy shoots (and therefore the tillering value) has decreased, with the exception of *Festuca rubra fallax*, *Poa serotina* and *Phleum Michelii*, in which the tillering value is higher.

If the number of the culms and leafy shoots of the parent alpine form be taken as 1, the following series represents the proportional numbers in the varieties which have been further cultivated.

	Culms	Leafy shoots
Festuca pratensis	6.38	0.66
» *arundinacea*	6.25	0.40
Agropyrum caninum	5.67	0.25
Phleum Michelii	4.12	1.63
» *medium*	1.82	0.56
Poa serotina	1.80	1.80
Festuca rubra	1.17	0.86
» » *fallax*	1.07	1.56

2. A remarkable character of all these varieties under further cultivation is the greatly increased yield of seed, which in *Festuca arundinacea* is nearly twenty-four times as much as in the parent alpine form.

In correlation with this is the increase in the number of spikelets per individual in the new varieties.

3. In like manner the fodder yield increases in the case of the new varieties, though not to the same extent as the extra seed production; in the selected variety of *Festuca pratensis* it reaches more than ten times as much as that of the parent form.

4. If, as in the case of the number of culms and leafy shoots, 1 is taken for the yield of the parent alpine form per unit area, we get the following figures for the seed and fodder production of the new kinds. These tables clearly demonstrate the superiority of the latter, not only over their parent forms, but also in comparison with the commercial varieties. A comparison between the two tables further shows that the highest seed yield does not coincide with the largest fodder production.

Seed yield of the selected varieties.

	Kragl selected variety	Commericial or original variety
	—	—
Festuca arundinacea .	23.9	4.4
» *rubra fallax* . .	16.6	5.5
Agropyrum caninum .	11.2	—
Phleum medium . . .	9.3	5.7
Festuca rubra	7.1	3.1
Phleum Michelii . . .	6.7	1.1
Festuca pratensis. . .	3.9	1.4
Poa serotina	2.7	1.8

(Yield of parent alpine form at the Sandlingalp = 1).

Fodder yield of the selected varieties.

	Kragl selected variety
	—
Festuca pratensis . . .	11.8
» *arundinacea*. .	8.3
Agropyrum caninum .	3.6
Poa serotina	2.6
Phleum medium . . .	2.2
» *Michelii* . . .	2.2
Festuca rubra	1.5
» » *fallax* .	1.3

(Yield of parent alpine form at the Sandlingalp = 1).

The new varieties retained their acquired characters for three generations during further selection and multiplication, and these modifications even became intensified. These facts have been determined by the experiments of practical breeders.

IV. The Principal Results of this Work.

These may be summed up under three heads:

1. During the further cultivation, in sheltered, sunny spots in the mountains, of alpine forms bred under the influence of the alpine climate

from lowland grasses, new forms again arise; from these can be bred varieties which are not only far more productive than their parent alpine forms, but are also superior to the best kinds in use or in the trade.

2. The superiority of these varieties is chiefly shown by their seed yield. Thus, the further cultivated form of *Festuca arundinacea* in the third generation bears 23 times as much seed as its alpine parent. The further cultivated varieties have, as a rule, also exceeded their alpine parents in fodder production.

3. Experience shows that the seed production of all cultivated grasses decreases considerably, normally in their fourth year, and this falling off also occurs in the case of the new selection varieties; to obtain a larger and purer seed yield it is therefore necessary to renew the multiplication plots after some years by either transplanting or sowing new selected seed from the lowland selection garden; the latter must also be restocked with the varieties in question taken from the first selection ground, *i. e.* the alpine experiment garden. This entails a new and important interrelation between the alpine seed-breeding garden and the further cultivation of the alpine varieties in lower places, and also manifests the importance of the alpine seed-garden for the cultivation of fodder in valley farms.

If the data so far obtained do not permit of a decisive opinion being formed, especially as regards the lasting worth of the new selected varieties, they are yet not to be despised, for they open up a new field of work for both scientific research and practical agriculture.

1143 – **Selection of Pigeon-Pea or Rahar (*Cajanus indicus*).** — SIL, S. N., Improvement of Rahar by Selection. — *The Agricultural Journal of the Department of Agriculture, Bihar and Orissa*, Vol. I, No. 1, pp. 25-29 + 4 plates. Patna. April 1912.

Rahar is held in high esteem as a food in India. Its seed coats, young shoots and leaves make excellent fodder for cattle; its branches are used for roofing, basket and thatch work and the dried stalks for fuel. Its obvious importance in the rural economy of the natives makes this plant worthy of study and improvement.

Observations were commenced on Sabour Farm in 1908 with a Saran variety. It was noticed that considerable variation existed among the plants with respect to the following important characters: growth, marking and colour of the plant, plumpness of pod, colour and size of grains, and character of the flower. The variations were recorded as follows:

A. Habit of growth: 1) erect, 2) spreading.

B. Colour of pods: 1) violet, 2) white, 3) striped.

C. Fullness of pod: 1) inflated, 2) wrinkled.

D. Colour of seed coat: 1) reddish-brown, 2) white, 3) black, 4) spotted.

E. Size of grains: 1) large seeded, 2) small seeded.

F. Flower characteristics: 1) standard yellow, 2) standard yellow with red veins.

Among all the multitudinous forms possessing these characters, the writer observed a certain degree of correlation. He found the following correlated characters:

1. Erect type with large grains and entire-coloured pods.
2. Spreading type with small grains and striped pods.
3. Erectness in form with lateness of maturity.
4. Wrinkledness of pod with roundness of grain.
5. Spotted grains with extreme earliness.

Attempts at selection were also made with respect to earliness, wilt resistance and west-wind resistance. Selection work during two seasons produced the following results: 1) Early plants have a low spreading habit and the foliage and fruits small. 2) No morphological character appeared to be correlated with wilt resistance. 3) The thick-podded erect forms were generally more resistant to the west wind. 4) Large pods and seeds were associated with the erect habit of growth.

In the field trials the erect form was always found to be superior to the spreading form; it is now being grown as a general field crop at Sabour.

FORAGE CROPS. MEADOWS AND PASTURES

1144 – **Comparative Experiments on Red Clover of Different Origins at the Svalöf Institute during 1907 to 1912.** — WITTE, H. in *Sveriges Utsädesförenings Tidskrift.* 1913, p. 11.

Most of the red clover seed imported into Sweden is described as "Silesian" a small quantity as "Russian." The former brand includes not only seed from Silesia and neighbouring countries, but also that of Hungary, Austria, France, Italy, North America and Chile. Only the varieties resistant to a cold winter are of use in this country, and for the pastures of 3 to 6 years duration, which is the usual system in Sweden except the southern portion, a very hardy and persistent clover is required. Experience has shown that imported clovers vary considerably with respect to their hardiness and persistence, and this has been verified by the experiments conducted at the Svalöf Institute during 1907-12.

Most of the foreign varieties are early in maturity and characterised by erect slightly-branched stems and an early secondary growth, which enables two cuttings to be obtained; but they are of so short duration that the second years' crop is very small.

The largest yields have been obtained from seed from Silesia. Posen, Poland, Bohemia, the Rhenish Palatinate and Galicia, and often the second year's crop has been as large as the first. Moravian seed is somewhat inferior and that of Austria (with the exception of the Austrian countries already named) suffered very badly in the winter. Russian seed was better and equal to the Silesian. The Swiss variety "Matten Klee" gave a poor yield owing to its earliness and tenderness. The American varieties of the pubescent type have all given inferior yields, but their hardiness varied according to the latitude of their origin. The Italian, Brabant, and above all the English and Chilian clovers, were lacking in hardiness and durability. The late varieties from England and Bohemia matured early but they developed somewhat slower than the true Silesian clover.

The late variety, with tall much-branched stems, generally gives only a small aftermath, but its total yield for the first year is equal to that of the early variety; in the second year, in which it gives its biggest crop, it considerably exceeds it. Owing to its persistence (it will last five years), this variety is the only one suitable for pastures of long duration.

Most of the Swedish varieties were of this type, as also were those of Norway, Finland and North Russia. The foreign varieties, with perhaps the exception of those of Finland, were generally inferior to those of Swedish origin. These native varieties showed considerable differences in the periods of flowering and yields, the latter character being generally related to their lateness.

1145 – Manuring Experiments on Alpine Pastures in Carinthia: 1910, 1911, 1912.

— SVOBODA, H., of the Laboratory of the Institute for Resarch and the Examination of Foodstuffs of the Duchy of Carinthia at Klagenfurt. — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 745-789. Vienna, July 1913.

The results of this work and of two previous reports are given together as follows:

1. The soils of all the alps experimented upon were very poor in P_2O_5, K_2O and CaO. In 100 gms. of air-dried fine earth there were only in 4 cases more than 0.1 gm of P_2O_5. The other eight soils contained considerably less than 0.1 per cent of P_2O_5, namely 0.003, 0.008, 0.017, 0.019 per cent,, etc. The potash content of all the twelve soils was under 0.1 per cent., with a minimum of 0.024 per cent. Only two soils contained more than 1 per cent. of CaO, one upwards of 0.3 per cent, one over 0.2 per cent., five between 0.1 and 0.2 per cent., three under 0.1 per cent.

2. Tilling the Alpine soil gave everywhere good results; no soil can naturally be more benefited by physical improvement than Alpine soil.

3. In two of the experiments the same fact was observed: that in laying down a new ley on an alp after breaking up the old turf, the grass seeds that were sown did not sprout unless they were abundantly manured with farmyard manure or chemicals. After broadcasting, the grasses did not develop sufficiently to form the new turf till three and four years, according to the altitude. The vegetation obtained at last was poor and was composed chiefly of weeds, *Aira* and *Nardus stricta*.

4. With one single manuring of farmyard manure (St) or chemicals alone (K), or of a mixture of both (K + St) the average crop of hay was the following during the first five years, in cwt. per acre.

Manures	1908	1909	1910	1911	1912
Unmanured	7.71	8.76	14.01	19.59	12.22
St	17.44	20.72	19.20	20.89	14.19
K	18.56	14.30	19.75	27.92	17.43
K + St.	23.34	23.97	21.33	28.11	16.93

The crops from the unmanured plots are light on account of the impoverished state of the soil. Reckoning them at 100 the increases due to the manures are given below.

Year	Stable manure	Chemical manures	Stable and chemical manure
1908	2 to $2^{1}/_{3}$ times as much	$2^{1}/_{4}$ to $2^{1}/_{2}$ times as much	fully 3 times as much
1909	»	100 : 150 to 160	$2^{3}/_{4}$ times as much
1910	100 : 137	100 : 142	100 : 152
1911	100 : 106	100 : 142	100 : 143
1912	100 : 116	100 : 142	100 : 138

In some cases the writer observed extraordinary increases of the crop, as much as 4 to 7 times the amount from the unmanured plots. The results of the various years confirm each other satisfactorily.

The effect of the stable manure during the first and third years was equal to that of the chemicals, and in the second year even better, but in the fourth and fifth years it was considerably inferior and barely noticeable. The combination of stable and chemical manures had the best results and during the first three years was superior to that of the other manures applied separately; in the two last years however it was of equal value to the artificials. The considerably longer duration of the after effects of artificials as compared with farmyard manure is proved beyond all doubt. The after effects of stable manure lasted about three years, those of artificials about five. Only after this period did the increase of crop due to artificials cease to be noticed on some of the alps.

For the practical Alpine farmer—as in general for all farmers—the combination of farmyard and chemical manures is advisable.

5. Respecting the water content of green forage and the ratio between hay and the dry substance in hay the writer noticed variations ranging from 17.3 to 60.4 per cent. of hay in the green forage, while the hay contained from 80.3 to 90.1 per cent. of dry matter. The plots that gave the lowest yield, thus the unmanured and the St. plots, gave the driest green forage, the heavier bearing plots (K and K + St) the richest in water, there being a sort of compensation in the higher hay and dry substance content of the smaller crop. On the other hand the quality of the dry straw-like grass of the poorer plots is naturally inferior to that of the juicy forage of the good Alpine meadows, which is always richer in protein. In general it may be said, with the increasing yield of a plot the water content of the grass crop increases and this may be explained by the fact that the drying action of the sun is not so powerful on a dense vegetation as on a thin and scanty one.

Level Alpine meadows bear much more abundantly than those situated on slopes, which is to a certain extent due to the lesser leaching out of plant food from the humus and washing away of the fine earth and to the circumstance that the slopes in some aspects, are exposed to a more intense action of the sun.

The writer mentions another observation made elsewhere: the analysis of three samples of grass which was cut on August 22, 1912, near Mallnitz at different altitudes above sea level:

Height above sea level . . .	7 710 ft.	6 725 ft.	5 905 ft.
	per cent	per cent	per cent
Crude protein	17.90	15.90	12.90
Crude fat	2.62	2.64	1.84
Ash	8.34	6.62	9.58

From the above it would appear that the protein content increases with increase of altitude; this question is sufficiently interesting to deserve to be more closely studied and on more ample material.

6. The sowing of good forage grasses and clovers on Alpine meadows is a measure strongly to be recommended. In the above-mentioned experiments timothy and dog's-tail proved to be the best grasses; they are of slow but good growth both on limestone and on primary rocks. Fox-tail, yellow oats and alsike clover grew luxuriantly the first year after sowing, but then their growth slackened and they even disappeared completely. In order to prevent this disappearance it is necessary, after the first initial manuring, to repeat every year the application of animal and mineral fertilizers, for already after four or five years, areas which presented a quite different botanical population, lose the best sorts of grasses, get invaded by weeds and end by being covered with the same plants, generally of a poor description.

7. The use on the alps of the best possible artificials, notwithstanding the high cost of transport, which by suitable measures may be much reduced, is in the end the most profitable course to pursue, owing to the great increase of crops which they cause and to the length of time over which their after effects extend.

1146 – ***Desmodium hirtum*, Leguminous Forage Plant Recommended for the Prevention of the Development of Weeds and as Green Manure for Tropical Plants.** — Stolz, A. and Harms, H. in *Der Tropenpflanzer*, Year 17. No. 8. pp. 430-437. Berlin, August 1913.

This plant is an addition to the number of nitrogen-bringing green manure plants, which grow rapidly forming a dense cover, capable of preventing the development of weeds and of protecting the soil against leaching out by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. et Perr.) is fairly extensive. It is found in Natal. German East Africa, Senegambia, Sierra Leone, Togo and Kamerum. It grows from sea level up to an elevation of about 5 600 feet. It is a herbaceous climbing plant, the branches attaining a length of 3ft.

to 6 ft. In German East Africa the plant loses its leaves in July and and August and many of the branches die, but in September vegetation starts again, new branches cover those that have died and which go to form an excellent humus.

The production of the seeds is not very easy, consequently the writers recommend the following method. The seeds are sown in a rich, loose, fresh soil; the seedlings are transplanted when about 4 inches high into loose soil. Thus vigorous plants are obtained which produce numerous cuttings. The writers insist on the necessity of taking only rooted cuttings, and they advise choosing a rainy season for making a plantation and setting the plants 3ft. apart.

This *Desmodium* is very sensible to the physical state of the soil; it has a decided preference for tilled soils and develops much more in plantations than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep which completely prevents the growth of weeds and thus allows a great economy of hoeing; besides this, *Desmodium* may be utilized as green manure and as food for live stock, sheep and asses being especially fond of it.

1147 - **Cotton Problems in Louisiana.** — COOK, O. F. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 130, pp. 3-14. Washington, June 21, 1913.

FIBRE CROPS

The production of cotton in Louisiana is at present traversing a crisis of which the chief causes are the following:

1. — The higher cost of farm labour and the difficulty of finding sufficient hands for picking due to the double exodus to the cities and towns and to Texas.

2. — The boll weevil finds here specially favourable conditions: the presence of late maturing varieties of cotton, the great luxuriance of vegetative development, the great extent of wooded country, affording unusual facilities for the hibernation of the insect.

3. — The tendency of the cotton industry to replace the long stapled cottons by short staples is injurious to the lower Mississippi Valley (Louisiana and Mississippi) which produces the best Upland long-staple of all the cotton belt.

4. — The introduction of large public gins instead of the old separate plantation gins had led:

a) to a mixture of seeds rendering it difficult to secure supplies of good seed;

b) to a mixture of various cottons injurious to the quality of the fibre and causing complaints on the part of the buyers.

The writer studies the means of improving this state of things.

1. — Control of the boll weevil: *a*) promoting scientific research with the object of obtaining long-staple *early* varieties and testing the methods of cultivation calculated to increase this quality (root-pruning, closer planting, topping, etc); *b*) organizing communites of planters for the *collective* con-

trol of the insect, which is the only efficient means of obtaining practical results.

2. — *Improvement of the quality* of the produce by means of these groups of planters, who should rigorously select their seed and strive for a *uniform* product.

3. — *Education of the consumer.* The improvements of spinning machinery have made it possible to spin short cotton and produce fabrics closely similar to those previously made from long staples. But the short-staple fabrics are undoubtedly inferior in strength and durability to the long-staple ones. As this change is against the interests of the consumer as well as of the planter of long-staple cottons, and profitable only to the spinner, the public should be illuminated on the subject.

4. Lastly the writer proposes the acclimatization into Louisiana of other tropical crops, so that cotton may become a branch of a saner and more diversified system of agriculture, which would be especially advantageous for the better utilization of labour.

1148 – **Cotton in India.** — SCHANTZ, MAURICE in *Beihefte zum Tropenpflanzer,* Vol. XIV, No. 5-6, pp. 439-609. Berlin, August 1913.

This article supplements the monographs already published on Cotton Cultivation in the United States and Egypt.

Historical. — The author outlines the history of cotton cultivation from 800 B. C. Table I shows the effect of the War of Secession in 1861-1865 on the production of Indian cotton.

TABLE I.

Year	Exports	
	Quantity	Value
	tons	millions sterling
1860	170 300	7·3
1861	176 400	10.0
1862	211 100	18.5
1863	245 600	35·1
1864	234 400	36.8
1865	358 350	34·9
1866	189 950	16.2
1867	274 150	19·7
1871	361 250	20.9
1878	148 300	7·7

Many attempts have been made to improve the quality of this fibre and the results are now being felt. In particular the author mentions the work of the Cotton Supply Association, the British Cotton Growing Association, the International Federation of Master Cotton Spinners' and Manufacturers' Associations, and the Indian Government.

Soils — In India the three great cotton areas correspond to three great geological formations. 1) The northern zone comprising the alluvial soils of the Bundelkand and the valleys of the Indus and Ganges, which vary from the sands of Sind and the Punjab to the clays of the United Provinces. 2). The midde zone extending from Rajputana to the Dekkan consists of the famous " Regar " or Black Cotton Soil, the richest soil in India. 3) The Southern zone consists of a soil of crystalline origin and comprising the ferruginous, red and yellow lands. The " Regar " soil is also found in this zone, particularly in the districts of Tinnevelly and Coimbatore.

Climate. — Owing to the monsoons, India receives 90 per cent. of its rainfall during the summer or south-west monsoon. The distribution of the rainfall is very irregular, causing thereby the proverbial famines of dry years; the mean annual rainfall varies from 23 cm. to 358 cm. in the various provinces. When there is not enough rain the cotton has to be irrigated. The Government has been much concerned with this question and has restored the old canals and constructed new ones, so that in March 1912 the total length of these canals reached 58 000 miles.

Geographical Distribution. — Cotton is cultivated to some extent throughout India. In Berar one-third of the cultivated lands is given up to this crop, in Bombay 10 per cent., in Madras 5 ½ per cent., Central Provinces 4 ½ per cent., North-West Provinces 4 per cent. Sind 3 ½ per cent., and in the Punjab 2 ½ per cent. This shows the relative importance of this crop in each province, while the following figures show the distribution of the cotton areas in the different provinces.

Provinces	per cent.
—	—
Bombay	28
Central Provinces and Berar	22.5
Haiderabad	13.9
Madras	8.4
Punjab	8
United Provinces	6.2
Central Provinces	4.4
Baroda	3.1
Rajputana	2.1
Other provinces	3.4
	100

Species cultivated in India. — The writer has divided the different indigenous varieties into three groups: *Gossypium arboreum, G. nanking,* and *G. obtusifolium*. The exotic varieties which have been introduced with more or less success are divided into two groups according to the appearance of the seed, thus: *a*) with covered seeds - *Gossypium hirsutum* (Upland); *b*) with naked seeds - *G. purpurescens*, *G. vitifolium* and *G. brasiliense*.

Commercial varieties. — Table III gives a résumé of the characters of Indian cottons.

TABLE III.

Name	Colour and appearance	Length mm.	Diameter mm.
Oomras	white-cream, silky	—	—
Khandesh	dirty	10–16	1/50 – 1/75
Berar type	clean	10–25	1/50 – 1/75
Berar special good staple	clean	20–30	1/50 – 1/75
Dholleras	white, silky	15–25	1/40 – 1/100
Broach	white, silky, clean	16–26	1/50 – 1/75
Broach Surtee	veny beatiful white, silky	20–30	1/50 – 1/75
Bengal	white mixed with yellow flocks	13–16	1/30 – 1/60
Sind	clean, yellowish white	13–16	1/40 – 1/75
Punjab	white, half silky	17–22	1/40 – 1/75
Assam	white, very clean and short	10–13	1/20 – 1/65
Burma	white to khaki	13–16	1/40 – 1/75
Kumptas	yellowish brown, silky	19–22	1/30 – 1/65
Dharwar American	beatiful white, silky	16–20	1/40 – 1/75
Westerns	white to yellow, very dirty	20–24	1/60 – 1/90
Northerns	deep yellow to red	20–24	1/40 – 1/70
Cocanadas	reddish brown to white	20–24	1/40 – 1/60
Tinnevelly	white to cream, strong, silky	23	1/30 – 1/70

From the point of view of quantity, Oomras are the most important, representing almost half the production of India. The best quality cotton is the Broach, followed by Dharwars; Sindhs and Punjabis resemble the Bengal varieties which constitute the lower grades; whilst the Oomras are of average quality.

Area under cotton and yield. — The areas and yields of the various Provinces are given in Table IV.

TABLE IV.

Province	Area under cotton in thousands of acres	Yield in thousands of bales (400 lbs.)
Bombay	5 932	1 302
Central Provinces and Berar	4 523	910
Madras	2 426	317
Punjab	1 575	346
United Provinces	1 148	425
Sindh	288	121
Burma	227	45
Bengal	89	19
Assam and Eastern Bengal	86	31
N. W. Provinces	55	13
Ajmir and Marwar	51	20
Haiderabad	2 888	300
Central Provinces	1 314	206
Baroda	762	196
Rajputana	393	127
Mysore	154	19

Whilst the yield per acre for the United States is 175 to 215 lbs. and that of Egpyt 340, it is only 100 for India.

The yield varies considerably from the South to the North, where it is greatest. Table IV shows this variation and the effect of irrigation.

Yield of lint. — The quantity of lint amounts to about one-third of the weight of the crop : this proportion varies from about 25 per cent for Rozzi to about 41 per cent for Comilla.

TABLE V. — *Yield of cotton in lbs. per acre.*

Province	With irrigation	Without irrigation
Sindh	308	—
Ajmir and Marwar	—	192
Berar	—	144
United Provinces	190	130
Bombay	—	100
Punjab	109	80
Upper Burma	—	80
North-West Provinces	183	72
Bengal	—	75
Central Provinces	—	75
Mysore	—	52
Madras	—	45

Seeds. — The ratio by weight of the seeds to the fibre is about 7 to 3. Apart from their use for sowing they are largely used for feeding cattle on the spot (4 to 5 lbs. a day). The exports from Bombay for feeding are increasing each year.

Year	Exports of Cotton Seed
1897–98	28 360 cwt.
1900–01	225 000 »
1910	6 000 000 »

Cultivation — The cotton plantations are not in the hands of European planters, the crop being grown by the inhabitants. Sindh and Madras are the only Provinces in which the perennial species are still grown. The seeds, often mixed with other grains, are generally sown broadcast in the Central and United Provinces, Berar and the Punjab.

A rotation is practised consisting of wheat, millet, oleaginous and leguminous plants. About 10 lbs. of seed is sown per acre. Sowing is most usual in June, but there is probably not a month in the year in which sowing does not take place in some part of India. The growing period is similarly variable. The Oomra variety matures in 4 or 5 months, whilst Surtee Broach requires 8 months. The first picking generally gives the best quality and the second the greatest quantity, whilst the third is inferior in both quality and quantity.

There is not the same uniformity in production of cotton in India that there is in Egypt and the United States, so that the writer studies the different districts in detail.

Principal Cotton Centres.

1. *Punjab.* — The soil is generally alluvial or sandy, and owing to the mean rainfall of 600 mm. (150 to 180 mm in the West) the cotton crop requires irrigation. The canals are well developed and irrigate about seven million acres. The Chenab canal, the greatest in India, has transformep what was 70 years ago an arid desert near Lyallpur, into a fertile region. Half of this land is held by small owners (with 4 to 6 acres) who apply the principles of modern agriculture, and the yield is considerably greater in this district than in most of the regions of India.

2. *Bombay Presidency.* — *a*) *Sindh.* — This district resembles Egypt in being a desert traversed by a river and a fertile valley. The mean rainfall being only 180 mm., irrigation is indispensable; cotton is limited to the districts of Haiderabad, Thar and Parkar, where irrigation is possible.

The inhabitants cultivate only a third or even a fifth of their land, the Government allowing the land to be fallow for 5 years.

On the hill lands the Sailabi method is practised: first irrigation, then sowing followed by frequent irrigations, because the soil does not retain the water. The Bosi method is applied to the inundated area which is not irrigated after the sowing.

Since 1852, numerous experiments have been made to introduce varieties having a longer staple, but disease and atmospheric conditions have been unfavourable to their success. The experiments have shown that when the irrigation canals are finished, it will be possible to cultivate varieties of cotton such as Mitafifi, which, with careful harvesting and preparation, will equal the "fully good fair brown „ Egyptian. This would yield a profit of 60 rupees (80*s*) per acre in place of the 42 (57*s*) which is obtained in the Sindh under the same conditions. It is also hoped that similar success will be obtained with the Upland, which required only 12 to 13 irrigations in place of 22 required by Mitafifi.

b) *Gujerat North* or *Kaira-Ahmedabad.* — A sandy soil with a rainfall of 700 to 950 mm. produces a yield of raw cotton (variety Dholera) of 200 lbs. per acre without irrigation, and up to 1200 lbs. with irrigation. Most of this crop goes to the spinning mills of Ahmedabad.

c) *Gujerat South* — The famous variety Surtee Broach originated here. It is the best native variety, but Surat Deschi Broach is the most cultivated. The soil is a black clay, only tillable after the rains, which amount to 850 or 1150 mm. per annum. Irrigation is not practised; the people are intelligent and the system of cultivation is the best in India.

d) *Deccan of Bombay.* — This supplies most of the Bombay requirements. It has a clay soil and a mean rainfall of 700 mm. Cotton is the chief product of the North and the variety Oomras is mostly grown.

e) *Mahratta South* or *Karmatak.* — This region comprises the southern portion of the Bombay Presidency. About 600 000 acres are given up to cotton and two varieties are cultivated: 1) Kumptas, giving 300 to 400 lbs. of raw cotton with a yield of 25 to 29 per cent. of lint, is a variety of Broach and there s a tendency to substitute for it the true Broach which yields 100 lbs. p. acre, containing 34 per cent. of lint, with a market value

12 per cent. higher; 2) American Dharwar; this variety has degenerated and is being replaced by Cambodian.

3. *United Provinces.*—The western portion (Agra), which is well watered all the year, is the most important for cotton. About one-third is irrigated and the remainder receives an annual rainfall of only 820 mm. Some of the land is held by small owners in plots of 5 to 10 acres. The variety cultivated is Bengalee. Attempts to introduce varieties of long staple have been unsuccessful.

4. *Central Provinces and Berar.* — This is the centre of the cotton cultivation of India, and cotton here ranks second in importance in the textile trade. Three principal varieties are cultivated: *a*) Bani, one of the most beautiful cottons of India with a length of staple from 25 to 28 mm., and can be spun up to No. 40; it is being abandoned, an account of its low yield of lint (26 to 27 per cent) in favour of the more productive Jari. *b*) Berar Jari; this variety yields 35 per cent of lint, is very popular in the market on account of its wooly appearance, and is used in the manufacture of "Vicuna" cloth. It is a mixture of about 65 different varieties, amongst which are *G. malvensis, G. vera, G. rosea, G. rosea cutchia* and Bani. *c*) Buri: a Georgia-Upland variety obtained at Calcutta and the most hopeful of all the exotic varieties tried.

The most important cotton region is the valley of Payanghat, where the best product is obtained and 40 per cent. of the arable land is reserved for this crop. The rainfall varies from 750 to 1250 mm., and it is generally not necessary to irrigate. The methods of cultivation are quite primitive; cracking of the clay soil during the dry season takes the place of cultivation. Sowing takes place in June and the crop is harvested in October, as from November onwards the drought induces tearing of the roots.

5. *Madras Presidency.*— The annual rainfall is 700 to 760 mm. for Tinnevelly, 630 mm. for Coimbatore and 480 to 540 for Bellary; this is not always adequate and requires to be augmented by irrigation. The varieties cultivated are: *a*) Uppams, sown in May and July on the black cotton soil; they consist of about 8 different varieties, and are grown chiefly in the North of Tinnevelly and the south of Madoura. *b*) Nadam or Ladam, a perennial variety sown in September and November in red sandy soils; produces the cotton known as "cocanadas". *c*) Tellapatti (Uppam × Bourbon) yields Westerns (Bellary and Karnul) and Northerns (Tadpatri). *d*) Salems, a mixture of Uppams, Ladams, and Bourbon, met with in East Coimbatore. *e*) Cambodian has made rapid progress:

Years	1908	1909	1910	1911	1912
bales of 500 lbs.	40	1 650	7 500	30 000	80 000

On land manured and irrigated it gives 1250 to 1600 lbs. of raw cotton per acre, with a yield of 33 to 35 per cent. of lint; whilst the native varieties give 60 to 100 lbs. of lint, Cambodian reaches 500 and more, and the produce fetches 1*d* a lb. more.

Exports. — Cotton is an importamt factor in Indian commerce. In 1911-12 its export reached the value of 406 million rupees (27 millions sterling) made up as follows.

	Value in thousands of rupees.
Raw Cotton	293 341
Seed	15 191
Thread	75 901
Goods in bales	19 666
Shawls and handkerchiefs	1 525
Various	695
	406 319

The article concludes with a study of the cotton trade and industry of the Indian Empire.

1149 – **The Kapok Industry.** — SALEEBY, MURAD M. *The Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture, Bulletin* No. 21, pp. 41 + plates VIII. Manila, 1913.

The Bulletin is written to supply the steadily increasing demand for reliable information concerning the culture of kapok. It is based on experiences in Java and the Philippines.

The kapok tree is extensively cultivated in the East Indies, Tropical India, Ceylon, Java and the Philippines. There are some eight species of *Ceiba* known in Tropical America, but their product is inferior to that of the true kapok, *Ceiba pentandra* Gaertn. (= *Eriodendron anfractuosum* DC.). It is sometimes confused with the species of the allied genus *Bombax,* of which there are 40 or 50 species all yielding floss of an inferior nature. They can be distinguished by their much greater size (the true kapok seldom exceeds 40 feet) and their much larger red flowers, 3 to 4 in. in length.

Seed selection. — The majority of the trees in the Philippines are propagated by cuttings. Some are raised from seed without the slightest regard for the selection of good seed of desirable parentage, and this accounts for the lack of uniformity in size, number and development of pods. Seed should be selected from trees more than 5 years old, of rapid growth, early and uniform fruiting habits and which are heavy yielders.

The following table shows the wide variation in the characters of the pods.

Climate. — Successful cultivation can only be accomplished in the tropics, and the best results are obtained at an altitude below 1,500 feet. It can withstand comparatively long periods of drought and from the first appearance of the flowers until the pods have been harvested a period of drought is essential. Continuous showers of rain during this period, especially the latter part of it, often seriously interfere with the development of the pods and damage the floss. Strong winds, particularly typhoons, cause serious damage to the long heavy horizontal branches and often uproot the trees.

Length of pod	Total weight of pod	Weight of floss	Number of seeds
mm.	gms.	gms.	
152	39.5	7.0	166
137	33.5	5.9	184
129	30.0	5.0	149
113	27.0	4.9	109
106	24.7	4.7	183
101	17.5	3.0	71

Cultivation. — This tree flourishes in a wide range of soils, but the best results are obtained from a well-weathered volcanic soil. Inferior soils are generally considered unsuitable for planting on a large scale, and owing to the somewhat low returns from kapok it does not justify itself on a rich soil unless grown as a subsidiary crop.

Cuttings should not be of the same season's growth; they should be of one half to 2 metres (18 in. to 6 ft. 6 in.) in length. They are planted about 50 cm. (20 in.) deep at the beginning of the wet season. Trees grown from cuttings generally yield a crop 6 to 12 months earlier than those from seed, but seed propagation has distinct advantages in healthier trees, more productive and resistant to wind and pests. Seeds are sown at the beginning of the wet season in hills 15 cm. (6 in.) apart. Until the seedlings have attained a height of 12 to 15 cm. (5 to 6 in.) they require shade protection. They are ready for transplantation at the age of 10 to 12 months. Before transplanting, all the leaves should be removed and the stem cut back to a height of 50 cm. (20 in.). The trees should be planted in straight rows 6 or 6 ½ metres (20 or 22 ft.) each way. No cultivation is required when established, unless some intermediate crop is grown. As secondary crops the following are recommended: Maguey, sisal, henequen, Mauritius hemp.

Harvesting. — The first crop is obtained between the third and fourth year; normal crops are borne in the sixth and seventh years, with an increasing yield up to the thirtieth year. Harvest must be completed in June before the wet season. The pods are harvested when light brown and wrinkled. Unripe pods yield floss lacking in lustre and liable to fermentation, while over-ripe ones yield a dull floss lacking in elasticity. The floss must be sorted, graded, and cleaned. Hand cleaning is very tedious and is now superseded by specially constructed machinery.

Marketing. — It is generally sold under two classes, cleaned and uncleaned. Each class is further subdivided into grades thus:

A. Cleaned: 1) extra; 2) good (prime Java), or first quality; 3) second quality; 4) damaged.

B. Uncleaned: 1) good, or first quality; 2) ordinary or fair quality; 3) damaged.

The bales are made of about 10 cubic feet capacity and weighing between 80 and 100 lbs. To effect this, a pressure of 80 000 lbs. is required.

Production. — Java and the Philippines are the chief countries exporting kapok, and the amount exported is but a small fraction of the quantity produced.

Years	Total exported in tons	
	from Java	from the Philippines
1903	4 400	—
1904	4 675	—
1905	6 300	4
1906	5 875	13 ½
1907	8 250	37
1908	6 900	27
1909	8 000	10
1910	7 930	30
1911	9 906	98
1912	10 235	31 ½

The exports from British India and Ceylon amounted to 200 tons in 1870 and this amount has not increased since; the product is decidely inferior to that from Java.

Yield. — From average trees of normal growth under seven years of age the yield is estimated at 350 to 400 pods. Trees from seven to ten years should yield 600 pods or more.In some cases 150 pods yield 1 kilo (2.2 lbs.) of floss, but the average is more nearly 230 pods per kilo. Thus 1 hectare of land containing 280 trees should yield about 100 000 pods, producing 450 kilos of clean kapok per year. In the tenth year this would be increased to 640 kilos. The yield of seed is double that of the floss.

By-products. — The seed is roasted for food by the natives of India in times of famine. The Chinese and Javanese extract an oil from the seed, which is used for soap making and adulterating other oils, whilst the residue is used as a manure or as cattle feed. Analysis shows that the seed contains about 2 per cent. of oil.

The trunk is used for telegraph poles and as a support for pepper plants. Its wood, which is light and soft, is used for tanning leather and other minor purposes. It also yields a dark red opaque gum which has medicinal value. The bark contains a reddish fibre sometimes used for tying purposes.

Enemies and Diseases. — It has few serious enemies. *Dysdercus cingulatus* Fabr. attacks the pods, and a species of *Helopeltis* attacks the leaves. The worst enemies are bats and monkeys. No fungus or bacterial disease has yet been reported as attacking the kapok tree.

1150 – The Cultivation of Sisal Hemp in German East Africa (1). — BRUCK WERNER FRIEDERICH in *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, No. 244, 70 pp. Berlin, 1913.

Historical. — In the agricultural annals of the German colonies there is perhaps no example of so rapid a development as that of sisal. In 1893 Hindorf, on behalf of the German East Africa Company, bought in Florida 1000 sisal plants which were sent to the Kikogwe plantation near the mouth of the Pangani; of this number only 62 took, and this is the origin of sisal cultivation in German East Africa which in 1912 occupied 52750 acres.

Extent. — In this colony sisal is cultivated: 1. In the North along the Tanga-Moschi and Korogne railways at the mouth of the Pagani. 2. From Dar-es-salam to Kilossa. 3. In the South in the Lindi Mikindani region near the mouth of the Rowuma.

After ceara, sisal is the most important industrial crop of this region.

	Area		Value of Exports
	Planted	Bearing	
	acres	acres	£
Ceara	80 724	28 469	233 134
Sisal	52 697	28 067	221 002

Progression of the Exports of Sisal.

1901	15 tons
1905	1 400 »
1910	7 000 »
1911	10 000 »
1912	16 000 »

Varieties. — An unsuccessful attempt was made to introduce white sisal from Yucatan: *Agave Fourcroydes* (Lemaire) or *A. elongata* or *A. rigida* var. *elongata*. At present the only variety grown comes from Florida (cf. Historical); it is the same as "Henequen verde" of the Spaniards or "grüner Sisal" of the Germans; its botanical names are *Agave Sisalana* Perrine or *A. rigida* var. *Sisalana*.

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(1) For conditions of soil, cultivation etc. see also a report of a journey of instruction by Hr. Bruck in No. 250, *B*, March 1913. (*Ed.*).

Climate. — In German East Africa, sisal can be cultivated up to 1480 feet above sea level, but the best results are obtained below 660 ft. The amount of rainfall may vary from 39 to 48 inches, and it may even sink to 31 inches if the moist and dry seasons are sharply separated.

Position of Grman East Africa in the world's market of Agave fibre.

Henequen (Yucatan sisal)	136 766	tons
Sisal (Green sisal):		
German East Africa	15 700	»
Java	3 900	»
Bahamas	3 100	»
Hawai	492	»
Papuasia	295	»

1151 - **Elaeis Fruits without Stones.** — Gatin, C. L. in *Journal d'Agriculture tropicale*, Year 13, No. 145, pp. 205-208. Paris, July 1913.

OIL CROPS

All seedless fruits are called *parthenocarpic* and the phenomenon which results in the production of fruits without seeds is known as *parthenocarpy*.

Parthenocarpy is said to be *vegetative* when the pollen does not come into contact with the pistil; and *stimulative* when the pollen coming into contact with the stigma does not cause fecundation but only a slight stimulus.

Varieties of Elaeis nigrescens.

Varieties		*communis* (A. Chev.)		*pisifera* (A. Chev.)	*Ceredia* (A. Chev.)
		typical form	form with thin shell		
normal fruits	1) oily pulp, proportion by weight . . .	48 %	68 %	84 %	85 %
	2) stones . . .	large thick shell	tendency to grow smaller	small, shell very thin, sometimes absent	small, thin shell
abnormal fruits	1) proportion by number . . .	1/10	1/10	rare	2/3
	2) characters . .	small, pulp: not very oily: very hard stone	oily pulp: tender stones		almost as large as the normal fruit, pulp oily

The parthenocarpic fruits of *Elaeis* seem to belong to this latter case; a closer knowledge of their production would be of great interest from the point of view of the study of the biological conditions attending upon the production of varieties.

The subspecies *Elaeis virescens* will not be considered, not being of interest from a cultural point of view.

The table on the preceding page shows the difference between the several varieties of *Elaeis nigrescens*.

This table shows two points upon which selection should bear.

1) *Normal fruits*. The *pisifera* variety is particularly interesting for the reduction of its stones.

2) *Abnormal fruits*. A special position must be accorded to the *Ceredia* variety, which shows a considerable proportion of fruits without stones.

RUBBER, GUM AND RESIN PLANTS

1152 – **Contribution to the Study of the Castor-oil Plant.** — RIGOTARD, L. in *L'Agronomie Coloniale*, Year 1, No. 1, pp. 15 to 21. Paris, July 1913.

The writer gives some data as to the yield in oil of castor-oil seeds from French West Africa.

Guinea: Brown mottled seeds; oil from the whole seed 42.50 to 46.02 per cent.

Irory Coast: Brown mottled seeds; stems brown or red. Oil: 43.36 to 46.20 per cent.

Upper Senegal, Niger.—Several varieties (blood-coloured castor, green, Brazil, Zanzibar, etc.): 41.7 to 54.6 per cent. This latter figure, which corresponds to 64.77 per cent. of oil in the kernel, has been obtained from seeds that came from Brazil and were cultivated in French West Africa. As term of comparison it is stated that Indian castor gave an average of about 47 per cent.

1153 – **Plantation Rubber in Hawaii.** — ANDERSON, W. A. in *Hawaii Agricultural Experiment Station, Press Bulletin*, No. 44, pp. 1-12. Honolulu, July 1, 1913.

This Bulletin contains the last results obtained in the Naliku plantation.

1. *Distance*. — It is more advantageous to plant closely and subsequently thin out until those that remain are 20 by 20 feet apart, than to plant the trees at once at this distance. The chief advantage of the system is that it allows selection by means of thinning. The disadvantage of less uniformity of the stand due to selection will be amply compensated by the increase of yield duing the first years (owing to the greater number of trees).

2. *Multiplication*. — In order to make a new plantation the best way is to use selected cuttings taken from the best yielding trees.

3. *Cultivation*. — The control of weeds by means of hoeing is too costly and causes loss by erosion; the most practical method was found in the arsenite of soda spray, provided it be not allowed to touch the stems of Ceara trees under two years of age or of Hevea trees at all. The aeration of the soil by means of dynamite costs only 15 to 20 dollars an acre, and does not cause much erosion.

4. *Tapping.* — Up to now the best way of tapping Ceara consists in removing the outer bark in narrow vertical strips and tapping these strips by incision, allowing the latex to coagulate on the ground. It is hoped that a good type of container will soon be found.

5. *Curing* — This operation has a very great influence on the quality of the product. Drying in the air at ordinary temperature has not given a uniformly good product; it should be completed by the vacuum dryer at artificial temperatures not greater than 120° F.

6. *Value.* — When it is properly prepared, Hawaii Ceara commands prices not much inferior to those of Ceylon plantation, namely about 5 to 10 per cent. less.

1154 - **Experiments in Manuring on a Tea Estate in Darjeeling.** — BALD, C. in *The Agricultural Journal of India*, Vol. VIII, Part. II, pp. 157-160. Calcutta, April 1913.

VARIOUS CROPS

The plan of the experiments was as follows:

No. of plot (each measuring half an acre)	Manure applied		
	1909	1910	1911
1	Castor meal, 14 maunds per acre	Castor meal, 4 maunds per acre.	id.
		Nitrate of potash, 40 lbs. per acre.	id.
		Superphosphate, 120 lbs. per acre.	Superphosphate, 60 lbs. per acre.
			Sulphate of ammonia, 120 lbs. per acre.
2	Mature leaves of *Cajanus indicus*.	id.	id.
3	Castor meal, 7½ maunds per acre	Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	Animal meal, 2 maunds per acre.
4	Nothing (check plot).	Nothing (check plot).	Nothing (check plot).

The block of land which was selected for these experiments was as nearly equal in quality as it was possible to obtain, but the event proved that the quality of the check plot soil was the best.

A digest of the results for the three years in crop is as follows:

Tea per acre in	1909	1910	1911	Total
	lbs.	lbs.	lbs.	lbs.
Plot No. 1	247	265	345	857
» No. 2	239	313	324	876
» No. 3	258	270	312	840
» No. 4	275	305	286	867

With a view to determining whether there was any difference in the quality of the teas produced under the different circumstances, samples of tea from all four plots were prepared and were valued on September 18, 1911. The valuations per lb. were 10½*d*, 11*d*, 9*d* and 1*s* respectively.

The cost of treatment works out as follows:

	1909			1910			1911			Total		
	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
Plot No. 1	4	5	4	2	4	6	2	19	6	9	9	4
» No. 2	—	6	1	—	6	1	—	6	1	—	18	3
» No. 3	2	2	8	1	1	10	1	1	2	4	5	8
» No. 4 check plot; no expenditure.												

The total crop from No. 4 is comparatively high. Apart from the question of the relative quality of the teas produced, the extra crop from No. 3 is not sufficient to pay for the treatment given it, while the cost of treatment to No. 1 is altogether prohibitive.

The valuation of the samples places No. 4, the untreated plot, much higher than any of the others, while the green-manured plot comes second and the plot treated with animal manure is given a very low place. The valuations, however, cannot be regarded as final.

Some of the outstanding facts in connection with these experiments are the high cost of chemical and artificial manures in a remote district like Darjeeling, the extreme doubtfulness of their economic utility, and above all the fact that green manuring is the cheapest method and at the same time produces remarkably satisfactory results.

1155 – **Cultural Experiments with Medicinal Plants at Korneuburg in 1912.** — MITLACHER, WILHELM. (Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzeneipflanzen in Oesterreieh, No. 15) in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 8, pp. 833-848. Vienna, August 1913.

A comprehensive report of the cultivation of medicinal plants in Austria in 1912. Detailed information respecting the sowing, development, management (in many cases manurial experiments), harvestings, yield, etc., of the following plants: hollyhock (*Althea rosea*), *Ancyclus officinarum*, *Angelica archangelica*, *Anthemis nobilis*, marigold (*Calendula officinalis*), *Cnicus benedictus*, hemlock (*Conium maculatum*), thorn-apple(*Datura Stramonium*), field poppy (*Papaver Rhoeas*), *Datura Tatula*, foxglove (*Digitalis purpurea*), *Gentiana lutea*, *Grindelia robusta*, *Hyosciamus agrestis*, henbane (*Hyosciamus niger*), *Hydrastis canadensis*, hyssop (*Hyssopus officinalis*), *Mentha crispa*, lavender (*Lavendula spica*), *Levisticum officinale*, *Mentha canadensis* var. *piperascens*, peppermint (*Mentha piperita*), rue (*Ruta graveolens*), sage (*Salvia officinalis*), *Spilanthes oleracea*, valerian (*Valeriana officinalis*), *Verbascum phlomoides*.

1156 – **Cultivation of Lavender in the South-East of France.**— ROLLAND, M. in *La Vie Agricole et rurale*, Year 2, No. 37, pp. 285-289. Paris, August 16, 1913.

Economic position of essence of lavender. — For the last twelve years the price of essence of lavender has more than doubled, and has kept during several seasons at about 10*s* 9*d* per pound. This rise seems to be due to the discovery of a process which allows the economic extraction from this essence of some compounds used in the manufacture of perfumery. On the other hand the yield of lavender plantations diminishes rapidly and the work of reafforestation carried out by the Forest Administration reduces considerably the areas on which wild lavender grew.

Species of lavender. — They are numerous in France. But as the most esteemed French lavenders are those gathered on the subalpine chains of the South-East, especially in the Departments of Drôme, Hautes-Alpes, Basses-Apes, Vaucluse and Alpes-Maritimes, the writer only mentions the types of lavenders which are found in that region and which are interesting from a cultural point of view. The essence of lavender proper is supplied by two forms of *Lavandula vera* DC.: *Lavandula vera fragrans*, Jord. and *Lavandula vera delphinensis*. These are the only two small species which deserve to be multiplied and they are found most frequently associated in their natural habitat. These two real lavenders are not found in the South-East at a height inferior to 1300 feet. Below this height they have yielded their place to common lavender: *Lavandula spica* Chaix or *latifolia* Vill. This lavender gives an essence of inferior quality, which is especially used in the preparation of varnishes and costs usually only from 2*s* 10*d* to 3*s* 7*d* per lb. In the belt where *Lavandula vera* and *L. spica* are neighbours, distillers have always found another species which they call "bastard lavender" and which yields a very inferior essence. M. Chatenier has recognized this bastard lavender to be a hybrid of *L. v. fragrans* and *L. v. delphinensis* with *L. spica*.

Essence of lavender. — The essence is especially concentrated in the flower, the peduncle containing only a very small quantity of it. In harvesting, however, this peduncle is cut at a length of about 4 to 6 inches, close to the first leaves. The composition of essence of lavender is complex. It owes its perfume to several bodies; it contains also some compounds which diminish its value to a varying degree according to the origin and the amount of care bestowed upon the distillation. It is admitted that the fundamental element of the perfume is an ether of linalol, the acetate of linalyle $CH_3COO.C_{10}H_{18}$. The amount of this ether contained in the real essences of lavender produced in the South-East of France is in some localities 40 to 42 per cent., while it sinks to 22 per cent. in less favourable situations.

Influence of altitude, aspect and nature of the soil. — In the cultivated state the two real lavenders thrive and acquire enormous development even on the sea coast, as is proved by some tests. The essences from plants gathered well below 1300 feet have commanded the same prices as those prepared from natural lavenders growing at medium heights. Aspect seems to exert an influence on the quantity and quality of the essence produced, but its effect unites with that of altitude; it remains to be observed in cultivations at lower elevations. As to soil, lavender seems not to be very exacting.

Creation of a lavender field. — M. Cornillac has planted a lavender field of 25 acres at about a mile from Valence. The soil is sandy with a good deal of stones and gravel; the subsoil, which begins at a depth of 16 to 32 inches, consists of big stones, gravel and building sand. The whole is a soil subject to drought and of a low value for farming. The land was ploughed to a depth of 16 inches and the lavender was planted, between November 15 and the end of February, in rows 46 inches apart, and the plants at 32 inches in the rows. These were transplanted from an altitude of 4000 feet: almost all of them struck, less than 1 per cent. failing. The field contains 105 000 plants, which cost delivered at the field 4*s* 4 ½ *d* per hundred. The men were paid 2*s* 9 *d* per day.

The cost of the whole field was:

	£	*s*	*d*
Ploughing[1]	25	1	3
Purchase of plants	230	3	4
Compost and manure	11	17	11
Planting	41	2	4
Total . . . £	308	4	10

or £21 9*s* per acre.

It is especially to be noted that the young plants cut with the pruning scissors, shoot forth again easily and that for this result it is of the greatest importance to keep the field free from weeds during the first year.

Sometimes, in planting a new field, old stocks are used; they are divided into pieces and planted, but their striking is uncertain. Young plants may also be obtained by sowing in a nursery. M. Cornillac has most successfully tried this method. The subsequent cultivation consists in hoeing two or three times. The first year the flowers that appear are suppressed so as not to exhaust the plants by allowing them to produce seed.

Lavender and truffle oaks. — The writer mentions several remarkable experiments on the growing of lavender in truffle producing oak plantations.

Regeneration of natural lavender fields. — Many landowners have commenced to regenerate their natural lavender fields by ploughing them in such a way as to leave only the plants in lines about 3ft. 3 in. apart.

Artificial manures. — Experiments hitherto made allow the conclusion to be drawn that the use of artificials increases the quantity of flowers; the yield in essence seems also to increase, and the quality of the perfume does not seem to be impaired.

Yield of a planted lavender field. — The writer, agreeing with M. Zacharewicz, states that an acre of lavender, planted in a favourable locality and manured with artificials, produces in ordinary years as follows :

1st year	Insignificant crop	
2nd »	1784 lbs. of flowers yielding	12.5 lbs. of essence
3rd »	3122 » »	21.5 » »
4th and following years . . .	4460 » »	31.2 » »

Thus at the average price of 10*s* per lb. the gross returns of a lavender field after its fourth year would be about £ 15 10*s*. The cost of gathering is not more than 5 ½*d* per hundred pounds. The cost of distillation is about 5 ½ *d* per lb. of essence. The cost of hoeing and of manuring is about £ 1 12 *s* per acre. All the expenses together are within £ 3 12 *s*. Thus the net returns are about £ 12 per acre.

Diseases of lavender. — The two most important, dodder and rot, are not much to be feared.

1157 - On an *Allium* from the Mediterranean Region which might be used as a Vegetable.

— TRABUT, L. in *Revue Horticole,* Year 85, No. 13, p. 311, 1 fig. Paris, July 1, 1913.

MARKET GARDENING

Allium triquetrum L. is well known along the Algerian coast, especially in the neighbourhood of dwellings and in gardens, and is very much appreciated by the Berber population, who use it in large quantities during the winter. The culinary experiments of the writer have shown that the entire plant can be used to replace other vegetables in the winter months. Its leaves are very tender when cooked and of good flavour.

The writer has also experimented with the cultivation of this onion; he found it necessary to plant the bulbs towards the end of summer at a depth of from 15 to 20 cm. (6 to 8 in.) in order to obtain a good substitute for leeks. The bulbs planted separately and deeply in good soil produce large plants in the winter, the portion below ground being blanched, very tender and appetising. With the green leaves removed they constitute an excellent vegetable free from all smell of garlic or leek and compatible with any sauce. The writer has no hesitation is recommending this vegetable thus treated as a most interesting acquisition to gardens on the border of the Mediterranean.

FRUIT-GROWING

1158 – **The Sexual Organs of Vine Hybrids.** — GARD, M. in *Comptes Rendus Hebdomadaires des Séanees de l'Académie des Sciences*, Vol. 157, No. 3, pp. 226-228. Paris, July 21, 1913.

I. In the cases of the male flowers (with long stamens) and the hermaphrodite flowers (with short recurved stamens), the pollen of the wild species is normal, the proportion of the empty grains not exceeding 10 to 12 per cent. In cultivated selected varieties, however, a larger degeneration was noticed, the empty grains amounting to 50 per cent. and upwards.

II. In the cultivated European vine two cases occur: 1) the pollen is often normal; 2) it consists of three kinds of grains: empty, normal and intermediate. According to the vine, sometimes the number of the two last are equal, sometimes one or other predominates, but the full grains are generally the most numerous.

In the wild varieties, as in the cultivated, the cases where the pollen is normal are more numerous than those where it is degenerate. We have no information as regards the causes of this degeneration.

III. The pollen of double hybrids is always modified, through to a varying degree, in the case of males, hermaphrodites with long stamens and hermaphrodites with short stamens. Often grains occur which are small, deformed, of abnormal appearance, not swelling in water, and with a very varied content resembling in optical section (like those of some cultivated vines) a cap, a crescent, or a crown.

In three-quarter, triple and quadruple hybrids there are also considerable differences according to the hybrid examined; the proportion of empty grains may be nearly normal or very great. The quantity of pollen can also present great variations.

The female organ, on the contrary, is as perfectly formed in hybrids as in species. The embryo-sac is never lacking in the ovules, and the pips are on the average more numerous than in the case of the parents.

IV. The pollen of short stamens, has, as is well known, very different morphological characters from that of the pollen of long stamens. From the cytological point of view, the writer has observed in the former a free generative cell and a vegtative nucleus similar to that occurring in the latter, while the deformed grains which are nearly or quite empty, in both cases lack a generative cell, or in any case the nucleus of the latter has degenerated.

Although not sterile as was supposed, the pollen of the short stamens is considered incapable of fertilizing the pistil of the same flower. The writer has proved the truth of this statement as regard *V. cordifolia*, Jacquez d'Aurelles, Blue Favourite, Massassoit and Black Eagle, while in the long-stamened flowers the pollen is fertile to the pistil of the same flower (1).

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(1) See No. 1430, *B.* Oct. 1912. (*Ed.*).

V. The facts presented by the sexual organs of vine hybrids are thus not an exception to those already known, and do not agree with the statements of M. Couderc. The male elements are altered to a more or less considerable extent, while the female organs remain intact, according to the rule that ovules which occur in small numbers undergo no degeneration.

Mr. Booth has described two distinct forms of pollen, the one fertile and the other infertile, independently of the length and habit of the stamens, and which may occur together in certain American vines. They no doubt correspond to the normal and altered grains of hybrids and of some original vines. Their occurrence in the varieties studied by the writer is no surprising matter, seeing that the former are natural hybrids, though this fact is denied by a certain American school which is under the influence of Engelmann's ideas.

1159 – **The Reconstitution of Swiss Vineyards.** — Faes, H. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1026, pp. 210-213. Paris, August 14, 1913.

In the spring of 1912, the Canton Vaud used in the reconstitution of its vineyards 1 371 250 meters (1) of "grafting wood", of which 194 150 m. were furnished by the Cantonal nurseries. The following were the varieties most in demand: Riparia × Rupestris 3 309 (625 300 m.), Riparia × Rupestris 101^{14} (300 400 m.), Riparia × Rupestris 3 306 (137 750 m.), Mourvèdre × Rupestris 1202 (99 500 m.), Berlandieri × Riparia 420 A (52 050 m.). The vintage of 1911, which was good on the whole, influenced the grafting of the spring of 1912 and gave rise to a greater demand of grafting wood (1 096 985 m. in the spring of 1911). A "grafting department" was carried on as usual at the Champs-de-l'Air Vine-growing Station.

In considering the vineyards in Switzerland which have been reconstituted on American stocks, it is possible, taking them as a whole, to arive at certain conclusions; though these may not be final, they are sufficiently satisfactory to permit of the work of reconstitution being continued with a certain amount of security.

At the beginning of the reconstitution operations, Riparia Gloire de Montpellier and Rupestris were used amongst other "pure American stocks" for a certain number of vineyards. Subsequently, Americo × American and Franco × American stocks have been substituted for those first planted and now tend to entirely replace them.

In the Canton of Geneva, it is found that Riparia Gloire, when planted, in a good situation on deep, damp, slightly calcareous soil produces regular and good crops. It has, however, the defect of sometimes losing its vigour, even after four or five crops, if it is planted in less fertile, although deep soil. It is thought that the hybrids give better promise, especially as regards duration.

At Neuchâtel, Riparia Gloire has proved to be prolific and has grown into a fine plant on certain rich, deep soils poor in lime. But these special soils are very rare in the district, where most of the soil is dry and shallow; Riparia, also, has never been a favourite in this Canton.

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(1) One meter = about 3 ft. 3 in. (*Ed.*).

In Ticino, Rupestris is being given up, as its wood ripens badly, especially in cold, wet seasons. It is also believed to have been observed that during severe winters, plants grafted on Rupestris suffer from frost more than do other vines. With regard to Riparia, the latter stock gave fair results in the southern part of the Canton, where the reconstitution work was begun on the best soils of the district. Disappointment, however, followed in the Lugano neighbourhood, where the soil of the vineyards is more stony. It is recorded that here also Riparia is abnormally productive at first, but soon perishes, all the more owing to the long pruning adopted in order to obtain a larger crop.

In the Canton Vaud certain soils have been found to be perfectly suitable to either Riparia or Rupestris. But in consequence of the short pruning practised in the Swiss vineyards, this latter stock tends frequently to promote the vegetative growth of its scion at the expense of the fruit, which causes the grapes to ripen late. Riparia Gloire has proved especially unsatisfactory on a heavy, cold type of soil, such as that often presented by glacial clays, irrespective of the amount of lime present.

Americo × American stocks, and especially Riparia × Rupestris, are being increasingly substituted for pure American stocks, owing to their greater powers of adaptation. Riparia × Rupestris 3 309, 101^{14}, 3 306 and 11-F form at the present time the basis of reconstitution in most of the Swiss vineyards with poor or average soil; of these the two former are by far the most common. So far, the said stocks have given satisfaction in the majority of cases. Solonis × Riparia 1 616, a hybrid much in demand only a few years ago, is now out of favour, as it is considered, perhaps wrongly, to possess insufficient power of phylloxera resistance. In the Canton Vaud, for instance, Riparia × Rupestris 101^{14}, which has already been planted in numerous vineyards, is without doubt a stock suitable to many average, rather heavy, and even heavy soils. It should not be planted in very light dry soils, or in those wanting in depth, for it is easily affected by drought. It nearly always prefers somewhat heavy soils to very light ones. This vine must not be grown in tufaceous soil, or in calcareous marls, as its resistance to calcium carbonate is not sufficient to allow of its normal development in soils of this nature.

In the same district, Riparia × Rupestris 3 309 gives excellent results on a large variety of soils, and replaces the Lot variety on gravelly and light soils. The writer has often seen magnificent specimens of this vine, covered with fruit, growing on the gravelly soil of the Aigle district. On the other hand, 3 309 having been quite recently introduced into Switzerland, the plantations on this stock are, as a rule, younger than those grafted on 101^{14}. When their progress has been followed for a few more years, it will be possible to decide authoritatively upon the type of soil best fitted for this vine, which is much in request now-a-days.

The Canton of Neuchâtel has proved especially suitable to Riparia × Rupestris 3 309.

In the Canton Ticino, Riparia × Rupestris 101^{14} has gained the favour of the vine grower. Its adaptability to vineyard soils of different compositions in that district is relatively great; its growth leaves nothing to be desired, and its fruit-bearing property is well developed. Riparia × Rupestris 3 309, which has recently been introduced, especially on dry stony soils, appears so far to be suitable also to the Ticino vineyards.

As regards the Franco-American stocks, Aramon × Rupestris 1 and Mourvèdre × Rupestris 1 202 have been planted, but very few Chasselas × Berlandieri 41-B. Franco-Americans have especially been used on compact calcareous soils, even when damp, where other stocks would not grow. At Arnex-sur-Orbe, in the Vaud vine district, there are very stiff calcareous marls containing a uniform amount of from 40 to 60 per cent. of very fine carbonate of lime. The whole series of Riparia × Rupestris, Solonis × Riparia 1616, the pure Americans, Riparia Gloire and Rupestris du Lot perish very quickly on such soils. Only Aramon × Rupestris 1, and especially Mourvèdre × Rupestris 1202, which is still more chlorosis-resistant, have given results which can be called favourable. It is also interesting to observe that hitherto in the Arnex vineyards, which are much infested with phylloxera, where this insect has done great damage since 1893, the above-mentioned Franco-American stocks proved sufficiently phylloxera-resistant, while the young vines of the country which had been planted along side by persons hostile to the new methods, succumbed within a few years to the persistent attacks of the insect.

In general, however, the present tendency in Switzerland is to reduce the number of Franco × American stocks used, as the reproaches levelled against the vines grafted on Rupestris du Lot are still more merited in the case of grafts upon Aramon × Rupestris and Mourvèdre × Rupestris 1202. These stocks have often a marked inclination to over-stimulate the vegetative growth of their scions; they run too much to wood. Some long methods of pruning occasionally remedy this defect, but produce large crops which are liable not to ripen well, especially in cold seasons. A delay in ripening is nearly always noticeable, under Swiss climatic conditions, in vines grafted on Mourvèdre × Rupestris 1202 or Aramon × Rupestris 1. This fact would not be of much importance if it were only a question of the quantity of the grapes, but the Swiss vine-growers are very tenacious in maintaining the quality of their local wines.

At the present time, many experiments are being made as to the possibility of substituting, especially in the case of choice vineyards, Berlandieri hybrids for the above-mentioned Franco × American stocks. Riparia × Berlandieri 420-A, and 157 157^{11} have been most used; 34 E M and Chasselas × Berlandieri 41-B appeared weaker. There still remain to be tried the stocks of the Hungarian Riparia × Berlandieri Teleki series, of which some seem worthy of experiment.

Owing to the fact that the Berlandieri variety was accustomed to a hot dry climate, the preconceived idea still prevailed only a few years ago that even the hybrids of this vine would not succeed in Switzerland. But in the experimental vineyards, the Berlandieri hybrids now bearing produce a crop which is relatively satisfactory, both as regards quantity and quality, even when growing in fairly northern situations, such as the Bernese vine-district on the shore of the Lake of Bienne. No doubt, during the first few years, the vines which have been grafted on these stocks do not develop as vigorously as their neighbours grafted onRiparia × Rupestris or Aramon × Rupestris 1 and Mourvèdre × Rupestris 1202, but they quickly make up for lost time and begin to bear. Vineyards which have been replanted with Berlandieri hybrids deserve to be studied and closely observed, but on the other hand they are not sufficiently numerous to allow of any comprehensive opinion being formed upon their value in the general reconstitution of the vineyards of Switzerland.

1160 – **Manuring of Coconuts in the Seychelles.** — RIVALTZ DUPONT. Contribution à l'étude du Cocotier aux Seychelles. — *L'Agriculture pratique des pays chauds*, Year 13, No. 122, pp. 345-355. Paris, May 1913.

The quantity of mineral matter removed from the soil by the coconut is considerable when the fibre and leaves are not returned. The coprah itself represents a very small proportion, only about one-fifth of this quantity. It is therefore desirable to utilise the leaves and other residues before considering other manures. The writer has studied the coconut fertilisers used on the two types of soil in the Seychelles.

1) *Madreporitic soils.* — They occur in the outlying islands, which are extremely fertile owing to deposits of guano having the following composition.

Moisture	7.20
Organic matter	12.50
Lime	44.30
Magnesia	1.70
Potash	0.38
Phosphoric acid	30.85
Sulphuric acid	0.69
Silica	2.06
Iron, alumina, etc.	0.36
	100.04

There is a deficiency of potash, but according to Boname the coconut utilises considerable quantities of sodium salts during the growth of the inflorescence, and it appears that less potash is consumed and the two bases are interchangeable in the requirements of this plant.

2. *Granitic soils.* — These soils require neutralising with lime or guano. Potash is generally deficient in soils that have been cultivated for a long time. Phosphoric acid is supplied economically by the guano, which costs only 16 to 24 *s* per ton at Victoria.

Potash manures. — Sulphate of potash should be prefered, as the unit of potash in it (at Bombay or Colombo) costs only 4*s* 9*d*, as compared with 7*s* in kainit. The writer recommends the application of 45 to 90 lbs. per acre buried in trenches round the trees.

Nitrogenous manures. The writer recommends green manures (*Tephrosia candida*, etc), seaweed and farmyard manure where possible. An excellent manure for coconuts could be obtained by the organisation of fisheries.

1161 – **The Forests of Taiwan (Formosa).** — THE GOVERNMENT GENERAL OF TAIWAN. Statistical Summary of Taiwan, pp. 21-24, 429-430. Tokyo, 1912.

The Island of Taiwan is rich in forests and in unreclaimed lands on the borders of those forests. Its total area, including the beds of rivers, is 13 888 sq. miles.

General Conditions of Forests. — The forests of Taiwan comprise, owing to the high altitudes of some of the mountains and to great variations in meteorological conditions, all kinds of vegetation belonging to tropical, subtropical, temperate and even to subalpine climates. The forests in the civilized part of the island had under the Chinese rule been to a large extent cleared of trees. Of late years, however, reforestation has been encouraged and a great improvement is already noticeable. The lands within the frontiers of the savage tribes are nearly all covered with primeval forests in which abound « obtuse ground cypresses » (*Chamea-cyparis obtusa* Sieb. et Zucc.), camphor-trees and « pointed oak » (*Quercus dentata*).

Preservation forests. — The utilization of forests in Taiwan is still in a state of infancy. As for the official exploitation of forests, the camphor industry is the only enterprise worth mentioning. Nevertheless the indiscriminate felling of trees for purposes of reclamation has caused grave fears to arise as to the proper caring for the river courses. It follows that while it is desirable to secure increased exploitation of forests, it is important to set apart certain preservation forests in the catchment basins. The Government General is therefore establishing such forests. Their area amounts already to 59 092 acres.

Lease or sale of government forests or wild lands. — The largest number of such transactions formerly took place under the Regulations for the Provisional Sale of Forests and Wild Lands, the total area disposed of in this way up to the close of 1910 amounting to 134 750 acres. Next in area come those dealt with according to the Regulation for the Encouragement of the Cultivation of Camphor Trees. In 1911, however, more forests and wild lands were sold under the latter regulations than under the former. The total area of forest and waste land sold and leased from the beginning up to the end of 1911 amounted to about 310 660 acres.

Afforestation and nurseries. — The Government is not only conducting afforestation on its own account, but is giving encouragement to private persons to engage in the same work. The trees thus planted consist of camphor-trees, *Acacia confusa*, Merril, pines, cryptomerias and other needle-leaved and broad-leaved trees. At the close of 1911 the total afforested area was about 39 200 acres.

Forestry Experiment Stations. — Owing to the special nature of vegetation in the island, the Industrial Section of the Department of Civil Affairs established in May 1911 the Forestry Experiment Station at Taihoku with two branch stations. According to its regulations the Station is to carry out the following work:

1. Investigation and introduction of useful plants both from Japan and from other countries.

2. Investigations and experiments connected with afforestation, as well as the exploitation and preservation of forests.

3. Improvement of seedlings and their distribution.

Training of forestry experts. — The primitive state of the forestry industry in Taiwan induced the Government in 1908 to commence training men for the work, so that every year fifteen experts may be supplied to the Local Government and to private parties.

In 1910 Rules for Investigating Forests and Wild Lands were issued, according to which the surveys and investigations of forests are being actively carried out.

Arisan forests. — These famous forests, which are being exploited by the Government of Taiwan, are situated within the savage land limits and comprise a total area of 26 950 acres containing timber estimated at over 200 million cubic feet. The forests are found at altitudes ranging between 2800 feet and 8700 feet above sea-level and are reached by a forest railway 41 miles long, from the main line. The exploitation of these forests was originally started as a private undertaking but was transferred to the Government through purchase in 1910. In the lower parts of the forest are found camphor-trees, oak, *Alnus maritima* Nutt. var. *Formosana* Burkill, *Machilus Thunbergii* S. and Z. and *Quercus cuspidata* Thunb., which are broad-leaved; in the upper portions occur the conifers: *Chamaecyparis Formosensis* Mats, *Ch. obtusa* S. and Z. form *Formosana* Hay, mixed with cedars, *Pinus Formosana* Hay, *Tsuga Sieboldii* Carr. The Government has adopted the plan of entirely renovating the Arisan forests in thirty five-years by felling certain portions each year and reforesting them afterwards. According to this plan the average felling each year will amount to 3 million cub. ft. of conifers and 1 200 000 cub. ft. of broad-leaved trees. A railway and a sawmill will be built, and nurseries have been laid out on 17 acres.

Canphor industry. — As has already been stated the principal utilization of the forests of Taiwan has been by the extraction of camphor, organized as a State monopoly. The Island's Monopoly Bureau sold 7236 810 lbs. of camphor abroad and 1 137 780 lbs. to the refiners in Japan, together valued at about £ 489 300.

It is undoubted that the camphor industry has suffered more or less as the operations for the better control of aborigines progressed; but the output of the year did not fall short of the estimates, the figures being 5961 983 lbs. of crude camphor and 7019896 lbs. of camphor oil. Of these the actual amounts received by the Monopoly Bureau were: crude camphor 6071 309 lbs. and camphor oil 7514489 lbs., which were less than the receipts for the previous year by 1 425 622 lbs. crude camphor and 1019732 lbs. of camphor oil. Up to 1911 the work of distillation was conducted entirely by private firms under contract with the Monopoly Bureau; but as there was much unnecessary waste and inferior quality of product the Monopoly Bureau began experiments in distilling camphor oil and in 1911 satisfactory new distillation arrangements were completed. But as the plant is not large enough, a part of the work is still leased out to private forms as formerly.

1162 – **Experiments on the Influence of Manures in Nurseries.** — Cuif, E. Research Station of the National School of Waters and Forests), in *Annales de la Science Agronomique*, Year 30, No. 6, pp. 433-454. Paris, June 1913.

The experiments of Bartet were taken up again on a new system in 1906. This article describes the method of experimentation followed and gives the results of some of the earlier experiments.

LIVE STOCK AND BREEDING.

HYGIENE

1163 – **The Cause of Fagopyrism. A Contribution to the Study of the Fluorescent Colouring Matters in the Seedcoat of Buckwheat..** — Fessler, Kurt in *Berliner Tierärztliche Wochenschrift*, Year 29, No. 28, pp. 497-499. Berlin, July 10, 1913.

After making analytical and spectroscopical investigations respecting the colouring matters of the seedcoat of buckwheat, the writer is of opinion that fagopyrism is caused by the crude chlorophyll.

1164 – **On Four New Species and Two New Varieties of the Ixodid Genus *Haemaphysalis*.** — Warburton, Cecil in *Parasitology*, Vol. VI, No. 2, pp. 121-130. London, July 1913.

In his short introduction, the writer mentions that the examination of a vast number of ticks collected in late years from various hosts in many parts of the world, has resulted in the addition of several new species to the genus *Haemaphysalis*; the number of recognised species in this genus now reaches 43.

Just as *Rhipicephalus* is proper to Africa, so *Haemaphysalis* is essentially Asiatic, and the Indian region has furnished most of the newly discovered forms. One of the species described by the writer is African, the remainder being additions to the Indian fauna. The difficulties presented by the genus *Haemaphysalis* are chiefly due to the fact that its characters are negative; the writer, however, states that there is no lack of clearly defined forms and gives a diagnosis.

Detailed descriptions follow of the new varieties and species mentioned below:

Haemaphysalis aborensis (Yambung, India), *H. howletti* (Rawalpindi, India), *H. aciculifer* (Uganda), *H. kinneari* (Kanara, India), *H. cornigera* var. *anomala* (India), *H. inermis* var. *aponommoides* (Belgachia, Calcutta).

Eight figures illustrate the text.

1165 – **New Species of *Ixodes*.** — Nuttall, G. H. F. Notes on Ticks. III: On Four New Spcies of *Ixodes*. — *Parasitology*, Vol. VI, No. 2, pp. 131-138. London, July 1913.

The new species described in this paper are of interest, although the writer is only able to deal with females, as is frequently the case with this genus. One species (*I. kempi*), allied to the North American *I. angusta*, comes from a hitherto unexplored region on the north-east frontier of India, having been collected by the Abor Expedition. Two species, *I daveyi* and *I. oldi*, are from Africa, and offer a peculiarity of structure in that they possess anal grooves having the form of a horse-shoe, an appearance only hitherto observed in three other species of *Ixodes*, all of which are African. The fourth species, *I. ricinoides*, is from China and is allied to *I. ricinus*.

The writer gives a description of the following species: *Ixodes kempi* (Kobo, Abor Country), *I. daveyi* (Rusvenzori, Uganda), *I. oldi* (Komatendu, Sierra Leone), *I. ricinoides* (Wen-chwan-hsien, China).

This article is illustrated by four text-figures.

ANATOMY AND PHYSIOLOGY

1166 – **The Distribution of Creatin in the Bodies of Mammals.** — BEKER, J. C. in *Hoppe Seylers' Zeitschrift für Physiologische Chemie*, Vol. 87, Part 1, pp. 21-37. Strasburg, August 16, 1913.

A communication giving the results of numerous analyses made to ascertain the creatin and creatinin content of the organs of cow, goat, pig, rabbit and dog. It was found that the largest amount of creatinin (314-451 mgm. per 100 gm. of organic substance) was present in the voluntary muscles, and the least (9-76 mgm.) in the thymus gland. In 100 c. c. of blood, 2.04 to 2.17 mgm. of creatin was found. In the foetal condition, mammals have little of this substance, though much is present after birth. In animals in advanced pregnancy, the absolute and relative creatinin content increases. The right horn of the uterus of pregnant animals contains more creatin than the left. The liver dehydrates creatin to creatinin.

1167 – **A Calorimeter for Small Animals.** — TANGL, F. in *Biochemische Zeitschrift*, Vol. 53, Part 1-2, pp. 21-35. Berlin, July 15, 1913.

This calorimeter is constructed on the same principle as Bohr and Hasselbalch's calorimeter devised for the determination of the heat production of the chicken embryo.

The heat production is thermo-electrically measured: the thermo-electric current produced by the increase of temperature determined by the production of the animal heat is measured by comparing it with the amount of heat derived from another source which produces an electric current of exactly the same strength (compensation). The calorimeter in question (of which the construction, working and management are minutely described by the writer, and of which he gives three diagrams), differs from the Bohr-Hasselbalch apparatus in the method adopted for the thermic isolation of the chambers containing the small animals, the isolation being made more complete by the use of Dewar flasks. The fact that the animals move during the experiment was taken into account in the method adopted. Rats, mice, frogs and leeches were used for the experiments. The duration was 10 to 24 hours; allowing 1 to 1 ½ hour to obtain the most exact compensation, there remain 8 to 22 hours for the estimation of the heat production. The weight of the body and all its excretions can be calculated to one-hundredth of a gram. The writer will communicate the results of the first experiment in a later number of the *Biochemische Zeitschrift*.

1168 – The Effect of Previous Nutrition upon Metabolism during Fasting. — SCHLOSSMANN, ARTHUR and MURSCHHAUSER, HANS in *Biochemische Zeitschrift*, Vol. 53, Part 4-5, pp. 265-299. Berlin, July 21, 1913.

On the conclusion of experiments on the interchange of gases in fasting children, the writers made further investigations at the Akademische Kinderklinik at Dusseldorf, in order to ascertain whether, and how far, a previous diet confined to one substance affected gaseous interchange in a hungry dog. The animals used for the experiment were first starved until they lost one-third of their weight, which was after the lapse of 16 days; their gaseous interchange (absorption of O_2 and production of CO_2) was then determined. Then the dogs were fed up to their original weight, after which followed another fasting period of 24 hours concluded by a respiration experiment. After the animals had taken food for the second time (for some days), their gaseous exchange was investigated for a third time at the close of another fasting period of 24 hours. The food given during the experiment was fat in the case of dog I, carbohydrate in that of dog II, and protein in that of dog III.

A second experiment was undertaken by the writers for the purpose of determining in what manner metabolism took place in a dog when deprived of food for some length of time. To this end, the three dogs were deprived of food, and after fasting for 24, 2×24, 4×24, 7×24, 8×24, 12×24, and 16×24 hours, the metabolic changes were investigated.

It was found from these two experiments that the respiration quotient $\left(\frac{CO_2 \text{ production}}{O_2 \text{ absorption}}\right)$ depends, in the case of a fasting animal, upon the substances which have previously taken part in building up its body. The effect of food of one kind upon gaseous interchange during fasting is thus discernible, even after the direct effect of the last meal has long passed away. In the case of animals which have been deprived of food, anabolism is effected in a manner corresponding to the combustion processes of the previous period. Through being fed upon a single substance, such as glycogen or fat, the body accustoms itself to consume more or less glycogen, or more or less fat. In animals accustomed to an exclusive fat diet, the respiratory quotient, even when they are fasting, is nearly the theoretical fat quotient; with an exclusive carbohydrate diet, the quotient approaches the theoretical carbohydrate quotient. In the case of long and continuous fasting, the influence on metabolism produced by a previous fat diet lasts longer than the effects of a carbohydrate diet, because the glycogen supply, when much drawn upon, is more quickly consumed than the fat supply.

By means of their diet, it is thus possible to exert a direct effect upon respiratory metabolism, and one which outlasts the feeding period and prepares the organisms for the task of breaking up larger amounts of fat or of glycogen.

1169 – The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchange. — GRAFE, E. and WINTZ, H. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 86, Part 4, pp. 283-414. Strasburg, July 21, 1913.

The writers summarize the results of the experiments of Barth, Röhman, Binz, Gerlinger, Gérard, Oppenheimer, Harnack and others upon the effect of sodium nitrate upon animal organisms.

They also give a description of their latest experiments made on a dog and three pigs, with the object of studying the action of sodium nitrate in decreasing the amount of nitrogen eliminated by the organism. They found, like Abderhalden and Hirsch, that sodium nitrate acts in four ways:

1. There is no change in the nitrogen exchange; the nitrate is again eliminated quantitatively.
2. The nitrate is eliminated quantitatively, but produces a great diminution in the loss of Kjeldahl nitrogen.
3. From 10 to 15 per cent. of the nitrate nitrogen ingested is retained in a stable form and remains in the body. At the same time, the Kjeldahl nitrogen exchange may, or may not, be modified in a favourable manner.
4. Strong doses of nitrate increase the elimination of Kjeldahlnitrogen.

The differences in the experimental results seem principally due to the amount of nitrogen administered.

1170 – The Effect of the Iron Content of Blood Meal upon the Iron Assimilation of Animals fed with it. — GROH, JULIUS in *Biochemische Zeitschrift*, Vol. 53, Part 3, pp. 256-258. Berlin, July 18, 1913.

The writer used as the subjects of these experiments two Yorkshire pigs weighing respectively 174 lbs. and 139 lbs. The experiment was divided into two periods, during one of which maize was fed, and during the other maize and blood meal. During the first period, which lasted 18 days in the case of pig I, and 8 days in that of pig II, the former received daily 4.4 lbs. of crushed maize, and the latter 3.3 lbs. The second period was preceded in the case of both animals by a preliminary feeding period of 21 days, and itself lasted for 10 days. During this time, the daily rations were 2.86 lbs. of crushed maize, and 0.44 lbs. of blood meal per animal. The iron content of the food and excrement were determined gravimetrically. The accompanying table gives the results of the experiment:

I. — *Maize period.*

	Pig I gm.	Pig II gm.
Iron ingested daily with the maize	0.425	0.323
Iron eliminated daily in the faeces	0.451	0.305
» » » » » urine	traces	traces
Balance of iron	—0.026	+0.018

II. — *Maize and blood meal period.*

	Pig I	Pig II
	gr.	gr.
Iron ingested daily with the maize	0.283	0.283
» » » » » blood meal	1.206	1.206
» eliminated daily in the faeces	1.483	1.509
» » » » » urine	traces	traces
Balance of iron	+ 0.006	— 0.020

Thus, in spite of the large amount of iron ingested, the animals did not assimilate an increased quantity of this substance.

1171 - **The Relation of Growth to the Chemical Constituents of the Diet.** — OSBORNE, T. B. aud MENDEL, L. B. in *The Journal of Biological Chemistry*, Vol. XV, No. 2, pp. 311-320. Baltimore, Md., August 1913.

A number of charts are given showing the results of further experiments in the feeding of rats on variously prepared foods. In conformity with the results obtained previously, both by the writers and other investigators: while a milk food (in the form of a paste consisting of 60 per cent. of milk powder, 12 per cent. of starch and 28 per cent. of lard) diet was capable of supplying rats with the necessary elements for both perfect growth and maintenance, the specially prepared "natural protein-free milk", or artificial preparations from pure chemical substances made to imitate closely the composition of the "protein-free milk", though capable of supplying the elements required for maintenance failed to produce perfect growth. Young rats fed on these diets developed normally up to a certain point, and then sooner or later succumbed, but recovery always took place if milk food was added to the rations.

While all the available evidence makes it extremely improbable that the difference in the relative efficiency of these foods is due to the proteins, the carbohydrates and inorganic elements are essentially alike in all, and all have been subjected to the same amount of heating. But the inefficient foods lack those components of milk which are separated in the centrifuge or removed by filtration (cream and any cellular elements) during the preparation of the "protein-free milk". In order to investigate the influence of the former of these factors, unsalted butter was added to the diet of rats fed on "natural" and "artificial protein-free milk". This proved to have the same restoring effect as the milk food, and experiments are now being conducted to investigate the matter more thoroughly.

FEEDS AND FEEDING

1172 - **Sorghum Crops for Silage. Feeding Experiments with Dairy Cattle.** — REED, O. E. and FITCH, J B. — *Kansas State Agricultural College, Experiment Station, Circular* No. 28, pp. 6. Kansas, 1913.

Sorghum crops, both saccharine and non-saccharine, can be used for silage with good results. The corn plant has considerable prestige as a silage crop, and has been more generally used for this purpose in Kansas than any other. As in most parts of Kansas the yield of sorghums, such as kafir and sweet sorghum, is considerably larger than that of corn (maize), it was thought that if these crops could be made into silage, they would be of par-

TABLE I.

LOT. I. — *Four cows.* — *Twenty-day periods.*

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Corn silage in ration	1 337	55	4 108
2. Cane silage in ration	1 252	51	4 131
3. Corn silage in ration	1 178	49	4 106
Average. — 1st and 3rd periods corn silage	1 257	52	4 108
2nd period cane silage	1 252	51	4 132
Difference	5	1	24

LOT. II. — *Four cows.* — *Twenty-day periods.*

Period	Milk	Butter fat	Body weight
1. Cane silage in ration	1 192	54	4 044
2. Corn silage in ration	1 167	51	3 953
3. Cane silage in ration	989	46	4 020
Average. — 1st and 3rd periods cane silage	1 091	51	4 032
2nd period corn silage	1 167	51	3 953
Difference	76	—	79

ticular advantage to the farmers and stockmen of the western district where corn is grown with much difficulty and uncertainty. Therefore, two years ago, the Dairy Department of the Kansas Agricultural College planned an experiment to determine the value of sorghums for silage.

The first sorghum crop put into the silo was sweet sorghum, commonly called cane. If the cane is put into the silo three weeks after corn silage is made, it is found that the former does not contain as much acidity as corn silage. The cane used in this experiment was grown on upland soil on the College farm, and the sorghum crop was larger than the maize crop, which occupied part of the same field.

In the following year 1912, one silo was filled with cane, one with kafir and one with corn; here again the same results were obtained with the cane as before. It made a good quality of silage containing less acid than the corn silage.

In 1911-1912 the first feeding experiment was made with milch cows, cane silage being compared with corn silage. Two lots of four cows each were selected for the experiment.

Lot I were fed for the first twenty days on corn silage. For the second 20 days (after an interval of 10 days), they were fed on cane silage. After another intervening period of 10 days the third twenty-day period began, when the cows were again fed on corn silage. The animals in lot II were fed cane silage during the first period, corn silage during the second period and cane silage during the third period. It was planned to get a direct comparison of these two feeds by comparing in each case the average of the first and third periods with the second period. Cows gradually decline in milk yield, and the average production of the first and third periods would naturally be about equal to the production of the second period. These cows were fed a grain and a hay ration in addition to the silage; the hay ration was kept constant, and the grain ration was fed in proportion to the amount of milk produced, which remained practically constant. The only change, then, in the ration during the experiment was the change made from one kind of silage to the other. The table on the opposite page gives the results of the experiment.

In studying the table of results on lot I, we find an increase in live weight during the cane silage feeding period; this increase is also observed on taking averages of the first and third periods, while the increase in milk and butter fat production during the corn silage feeding is so small as to be negligible.

Lot II gave similar results. The corn silage produced more milk and butter fat than the cane silage, while the cane silage caused gains in live weight. The results of the whole experiment suggest that cane silage is more fattening than corn silage.

During the winter of 1912-1913 a feeding experiment was conducted with fifteen dairy cows, in which comparison was made of the respective merits of three crops for silage: kafir, cane and corn. The general plan of the experiment was similar to that of the preceding year. Fifteen cows were divided into three lots. Lot I contained six cows which were used to compare kafir silage with corn silage, lot II consisted of five cows fed on cane and kafir silage, while in lot III four cows were used to determine the comparative value of corn silage and cane silage. The cattle in each lot were fed for three periods of 30 days each with a ten-day period intervening between the first and second periods, and also between the second and third periods. The experiment included only the 30 days in each period. Table II gives the results of the second trial.

The results of the experiments in Lot I indicate that corn silage is slightly superior to kafir silage for milk production, while kafir silage proved the more fattening.

In the second lot, kafir silage proved much better than cane for milk production. The cows made a very slight gain in body weight while on the cane silage.

In the third lot, corn proved superior to cane silage. The former produced a larger milk yield and a very slight gain in live weight.

TABLE II.

LOT I. — *Kafir Silage versus Corn Silage.*
(Six Cows — Thirty-day periods).

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Kafir silage in ration.	3 373	142	6 010
2. Corn silage in ration	3 383	140	5 994
3. Kafir silage in ration	3 339	139	6 021
Average 1st and 3rd periods, kafir silage	3 356	140	6 015
2nd period, corn silage.	3 383	140	5 994
Difference . . .	27	—	21

LOT II. — *Cane Silage versus Kafir Silage.*
(Five cows — Thirty-day periods).

1. Cane silage in ration	2 384	107	4 852
2. Kafir silage in ration	2 492	112	4 879
3. Cane silage in ration	2 139	98	4 927
Average 1st and 3rd periods, cane silage	2 261	102	4 890
2nd period, kafir silage	2 492	112	4 879
Difference . . .	231	10	11

LOT III. — *Corn Silage versus Cane Silage.*
(Four Cows — Thirty-day periods).

1. Corn silage in ration	1 953	89	3 743
2. Cane silage in ration	1 832	86	3 747
3. Corn silage in ration	1 852	85	3 755
Average 1st and 3nd periods, corn silage	1 902	87	3 749
2nd period, cane silage.	1 832	86	3 747
Difference . . .	70	1	2

In summing up the work of both trials, the following conclusions may be drawn.

1. Corn silage is slightly superior as a milk producer to silage made from either kafir or cane.
2. Kafir silage ranks second as a feed for milk cows.
3. Cane silage ranks third as a milk producer.

In both trials the cattle gained in live weight on cane silage more readily than on silage made from kafir or corn. This fact would indicate that the former contains more carbohydrates and sugar, or fattening substances, than the other feeds. In the writers' opinion, cane silage would prove the equal of corn or kafir silage if more protein and less fat-forming nutrients were fed in the grain ration, so that the animal could use the nutrients more economically.

Although kafir and cane silage were shown by the experiments to be slightly less valuable than corn silage, there are other factors that must be considered; namely yield and adaptability to local conditions. Without doubt, the greater yield of cane and kafir to the acre will offset the slight increase in feeding value to be obtained from corn silage. Kafir and cane are drought resisting crops, they can be grown over a wider teritory than corn, and yield from one-third to one-half more tonnage to the acre.

During both trials the acidity of the cane silage was never more than that of the corn silage. In the second trial the average acidity for the three different kinds of silage was as follows: corn, 2.03 per cent.; cane, 1.46 per cent. kafir, 1.43 per cent.

It was also noted during the experiment that most of the cane seed and a great amount of the kafir seed passed through the animals undigested. This suggests that the nutritive value of these crops as silage is limited to that of the stalks and leaves. The quality of silage obtained from all three crops was very good. The kafir silage was perhaps the poorest on account of its being immature. The cows eat the silage with relish, and appeared to prefer the cane silage.

The silage was stored in wooden-stave and in cement silos, and kept equally well in either case. The time of cutting cane and kafir is all-important in making good silage from these crops. They should be practically mature; that is the seed should be ripe. If cut too green the silage is sour. After a heavy frost, the crop should be cut and siloed immediately. If it dries out too much, sufficient water should be added to enable it to pack well.

1173 - **Manioc Roots and the Residues of their Elaboration.** — KLING, M. in *Die Landwirtschaftlichen Versuchsstationen*, Vol. 82, Part 3-4, pp. 211-233. Berlin, July 17, 1913.

From the roots of the manioc (*Manihot utilissima* Pohl) two kinds of starch flour are obtained, one of which is used as an article of diet, while the other is the starch (*Appreturmittel*) of commerce. Recently, the residues of this industry have also made their appearance on the market, especially in the form of cattle feeds.

TABLE I. — *Composition of dried manioc roots.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	11.28	—
Crude protein	1.35	1.52
Crude fat	0.27	0.30
N-free extract	83.27	93.86
Crude fibre	1.98	2.23
Ash	1.85	2.09

TABLE II. — *Composition of the starch made by Messrs. Zwick & Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.85	—
Crude protein	1.53	1.72
Crude fat	0.38	0.42
N-free extract	83.68	93.86
Crude fibre	1.55	1.74
Ash	2.01	2.26

Manioc is cultivated in the Malay Peninsula, in Africa, in South America, and especially in Java.

The residues of the Javan tapioca, called "tapioka ampas", find their way, like tapioca itself, to the European markets. The tapioca exported from Java in 1907 amounted to 21 000 tons, and in 1907 to 44 000 tons.

The Javan manioc roots which are only suitable for making commercial starch are sent to Germany and used as raw material, chiefly by the firm of Zwick and Sons, of Neustadt a. d. Hardt. The residues of this product appear on the German market under the names of "Stärkefuttermehl" (Starch feeding meal) or "Futtermehl Z" and "Stärkeschlempe". In the European feeding-stuffs trade the manioc root residues are also known as "Hollandisches Futtermehl", Tapioka-Ampas", "Strumbin", "Stärke-

TABLE III. — *Composition of the « Stärkefuttermehl » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.93	—
Crude protein	3.59	4.03
Crude fat	0.74	0.84
N- free extract	75.95	85.27
Crude fibre	6.10	6.84
Ash	2.69	3.02

TABLE IV. — *Composition of the « Stärkeschlempe » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	86.56	—
Crude protein	0.25	1.86
Crude fat	0.03	0.22
N- free extract	12.04	89.58
Crude fibre	0.78	5.81
Ash	0.34	2.53

abfall.", "Pflanzenmehl", "Schlempemehl" and "Webco". These residues are also often mixed with differend meals used as feeds.

No reliable data existed as to the chemical composition of the manioc roots, starch-meals, and residues of the roots. For this reason, the writer made the analyses given in the accompanying five tables.

The writer has also made a detailed analysis of the composition of the manioc roots. When well cleaned, they generally contain a little less moisture, protein, fibre and ash, but a little more fat and nitrogen-free extract than are given in Table I. The analyses show that the roots, like the residues derived from them, are poor in protein and fat, and that their food value depends chiefly upon their starch content. No experimental data are available as to their digestibility. The carbohydrates, especially the starch, of the "Stärkefuttermehl" ought to be easily digested.

Table V. — *Percentage composition of the manioc root residues known as « Stärkeabfall » and « Pflanzenmehl ».*

Constituents	Fresh material		Dried material	
	Stärkeabfall — per cent.	Pflanzenmehl — per cent.	Stärkeabfall — per cent.	Pflanzenmehl — per cent.
Moisture	10.3	11.68	—	—
Crude protein	1.12	1.25	1.25	1.41
Crude fat	0.12	0.21	0.13	0.24
N-free extract	80.25	76.60	89.46	86.73
Crude fibre	5.62	4.06	6.27	4.60
Ash	2.59	6.20	2.89	7.02

Amongst the residues analysed, the "Stärkefuttermehl" prepared by Messrs. Zwick & Sons possesses the greatest feeding value. The writer puts it at about £7 a ton, that is about the same as potato flakes. If the starch value of potatoes is taken at 77 per cent., that of the "Stärkefuttermehl" would be 70 per cent.

It is recommended to feed this product mixed with substances containing fat and protein and should these be poor in lime, phosphate of lime should be added. "Stärkefuttermehl" should be an especially suitable feed for calves. From the point of view of the dry matter, "Stärkeschlempe" is equal to "Stärkefuttermehl", but it has the disadvantage of not keeping longer than 14 days. The writer recommends "Stärkeschlempe" especially for pigs; it can be mixed with nitrogenous and fatty substances and those containing lime. Wet "Stärkeschlempe" costs about 3*s* per bushel, a price which nearly corresponds to its actual feeding value, when the cost of carting is not very high. As for the value of the other similar commercial products, what has already been said as regards "Stärkefuttermehl" holds good. Much care is required in purchasing these products, which are often adulterated by the addition of over 40 per cent. of carbonate of lime.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1174 – **The Show of Breeding Stock at Souk-Ahras, Algeria.** — Mellis, C. in *La Revue des Colons de l'Afrique du Nord,* Year 2, No. 23, pp. 362-363; No. 24, pp. 379-383. Algiers, June 1913.

At the second show of breeding stock organized by the Breeders' Syndicate of Souk-Ahras, held in May 1913, a thousand animals were entered; of these, 560 were awarded prizes.

The class for pure Tarentais cattle was good; the animals seem not to have lost anything in milk production or general characteristics in their new home, though they are somewhat darker and more irregularly marked.

The native cattle were chiefly of the Guelma breed, common in the mountainous parts; these animals are of a bright gray colour, with body compact and meaty, legs short, chest deep and wide. The cows are fairly good milkers; they cross well with Tarentais bulls.

The cross-bred Tarentais × native cattle showed a great improvement over those of the previous year. Three-quarter-breds are difficult to distinguish from the pure Tarantais; the half-breds too, especially the bulls, show a predominance of the Tarentais blood, being quite distinct from the native cattle in the high-set-on tail, wide hips and other characters; heifers at one year may weigh 550 lbs., and at two years 660 lbs. The writer believes this cross will be a success and will keep on improving under careful management and feeding.

HORSES, ASSES AND MULES

1175 - **Modifications in the Exterior Conformation of the Half-Blood Horse during Growth, in Prussia.** — WÖLTZ, W. in *Landwirtschaftliche Jahrbücher*, Vol. XLIV, Part 3, pp. 409-436. Berlin, May 1913.

It is some time since the writer pointed out the necessity of having measurements made on animals during the period of growth with the object of determining the intensity of development of the several parts of the body. A great number of measurements have been taken, especially on the basis of Lyotin and Nathusius' works and systems, on adult animals, but there is a great scarcity of such data on animals during growth. After mentioning the work done in this connection by Gisler, Mieckley, Schröder and Schöttler, the writer reports upon the systematic measurements made by him since August 1908, upon seven half-blood foals of East Prussia, about 6 months old. In August 1909 and 1910 the measurements were repeated upon the same animals. Thus the foals were measured at the successive ages of 6, 18 and 30 months.

Immediately after they were purchased the animals fell sick of glandular inflammation, which for a certain period retarded their development; nevertheless they were well cared for and their food was especially rich.

The measurements were most carefully taken so as to exclude errors as far as possible.

Some inacccuracies, however, must be considered inevitable, especially for certain measurements (thus for instance the length of the neck) which are difficult to take on young spirited horses. But taking an average of the figures obtained from seven animals tends to produce a compensation of eventual errors. Especial difficulties were encountered in measuring the length of the fore and hind cannon-bones. The writer measured these bones in the fore limbs starting from the pisiform bone and reaching the sesamoids and in the hind limbs from the point of the calcaneum to the sesamoids. Both measures thus taken exceed the real lengths of the metacarpus and of the metatarsus by about one-third, as they include the carpus in the fore limb and the tarsus with the calcaneum in the hind one. The circumference of the cannon-bone was always taken on the right limb.

The writer gives the results of his measurements in 14 tables, of which the last gives the averages of the 7 foals that were measured, both in absolute figures and in figures relative to the wither height taken as 100. In three separate columns the percentages of growth of the various parts of the body in the periods of 6 months, 1 ½ years and 2 ½ years are given.

Table I (next page) gives the summary of the data collected.

In two other tables are given respectively the absolute increase in centimetres and the increase per cent. of the various parts of the body. The measures are arranged in the order of their respective intensity of increase.

The figures given in Table I confirm the well-known fact that foals have in comparison much longer legs and shorter bodies than adult horses, while their chest and pelvis are also comparatively narrower.

It appears also that the lengthening of the body is specially connected with the growth of the barrel, that the length (upper and lower) of the neck increases relatively to the height of the withers, whilst (always proportionately) the length of the cannon bones diminishes and the ratio between the height of the withers, of the back and of the croup remains nearly constant. Always relatively, the dimensions of the body (breadth, depth of chest and width between hip-bones), the length of the shoulder-blade and the girth, and to a slight extent the circumference of the cannon bone, increase. The circumference of the hock diminishes.

In a separate table the writer compares the results obtained by him on half-blood foals from East Prussia with those obtained by Schöttler on Hanoverian half-bloods. These appear more precocious than the former.

The writer then examines the table in which the absolute growth, in centimetres, is given for the several parts of the body in progressive order.

He notes that the smallest increases are in those meaurements that depend particularly upon the increase in length of the cannon-bones. The other measurements follow in the order given in the table, with a maximum for the girth measurement.

Examining the table which shows the data referring to the percentage increase of the several parts of the body that were measured, in the order of intensity of growth, the writer remarks that it varies greatly, ranging from a minimum of 3 per cent. (height at withers) to a maximum of 33 per cent. (width at hip bones). The increase in length of the fore and hind cannon-bones was respectively 6.5 and 6.1 per cent., agreeing with Schöttler's observations on Hanoverian foals, in whch he also recognized the slight development of the metacarpus and metatarsus. The other measurements follow in the order set forth in the table. Among others the high percentage of the increases in the length of the neck, of the breadth and depth of the chest, and of the breadth between the hips are noteworthy.

In order to give a graphic demonstration of the foals that were measured the writer has added to his work a plan showing the three outlines corresponding to the average of all the measurements, taken respectively at the ages of 6, 18 and 30 months.

TABLE I.

Numerical order	Measurements	I			II			III		
		Average of measurements of 6 and 7 foals respectively.						Increase compared with measurements of 1908		
		1908 cm.	1909 cm.	1910 cm.	1908 %	1909 %	1910 %	In 1909 %	In 1909-1910 %	In 1908-1910 %
1	Length of body from point of shoulder to point of ischium	120.9	135.4	146.0	96.9	98.7	99.5	12.0	8.7	20.7
2	Length of forequarters	29.6	32.0	34.2	23.8	23.1	23.3	8.1	7.4	15.5
3	» of barrel	53.0	60.6	66.8	42.5	44.2	45.7	14.3	11.7	26.0
4	» of hind quarters	36.5	41.1	44.7	29.3	30	30.5	12.6	9.8	22.4
5	» of pelvis	—	44.5	46.4	—	32.5	31.6	—	—	—
6	From the pisiform bones to the sesamoids	29.3	30.4	31.2	23.5	22.2	21.3	3.8	2.7	6.5
7	From the calcaneum to the sesamoids	41.0	42.4	43.5	32.9	30.9	29.6	3.4	2.7	6.1
8	Length of shoulder-blade	37.9	42.4	46.7	30.4	30.9	31.8	11.9	11.3	23.2
9	» of neck (upper)	54.3	62.5	69.9	43.5	45.6	47.6	15.1	13.7	28.8
10	» » (lower)	36.6	43.5	45.8	29.4	31.7	31.2	18.8	6.3	25.1
11	» of head	—	—	—	—	—	—	—	—	—
12	Height of withers	124.7	137.1	146.8	100	100	100	10.0	7.8	17.8
13	» of back	120.5	133.2	141.5	96.6	97.2	96.4	10.5	6.9	17.4
14	» of croup	127.6	140.9	149.8	102.3	102.8	102.0	10.5	6.9	17.4
15	» of sternum (behind elbows)	73.6	77.1	81.8	58.9	56.3	55.8	4.8	6.4	11.2
16	Length of ilium	120.3	131.5	139.5	96.5	95.9	95.0	9.3	6.6	15.9
17	» of ischium	113.7	119.1	124.9	91.4	86.8	85.1	4.8	5.1	9.9
18	» of knee-cap	85.1	90.4	95.5	68.2	65.9	65.1	6.2	6.0	12.2
19	» of hock	56.7	57.4	58.4	45.4	41.9	40.0	1.3	1.7	3.0
20	Height of the shoulder joint	93.6	97.5	102.0	75.0	71.2	69.5	4.2	4.7	8.9
21	» of elbow	78.4	81.8	85.6	62.9	59.7	58.2	4.3	4.9	9.2
22	» of pisiform bone	42.5	44.3	46.3	34.2	32.3	31.5	4.3	4.6	8.9
23	Depth of chest	51.1	60.7	64.5	41.0	43.8	44.0	18.8	7.4	26.2
24	Front width of chest	29.1	33.1	35.5	23.4	24.2	24.2	13.8	8.2	22.0
25	Width of chest behind shoulders	27.0	32.4	34.7	21.6	23.3	23.7	20.0	8.5	28.5
26	Breadth within hip-bones	35.7	42.6	47.6	28.6	31.1	32.3	19.3	14.0	33.3
								cm.	cm.	cm.
27	Girth	133.7	150.4	169.1	107.2	109.7	115.2	16.7	18.7	35.4
28	Circumference of fore cannon bone	15.6	17.5	18.5	12.5	12.9	12.6	1.9	1.0	2.9
29	Circumference of hind cannon bone	17.1	19.6	20.6	13.7	14.3	14.1	2.5	1.0	3.5
30	Circumference of hock	35.0	37.4	38.8	28.1	27.3	26.4	2.4	1.4	3.8

TABLE II.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909 cm.	in 1909-1910 cm.	in 1908-1910 cm.
1	Height of withers	0.7	1.0	1.7
2	Length of pelvis	—	1.9	—
3	From the pisiform bone to the sesamoids	1.1	0.8	1.9
4	From the calcaneum to the sesamoids	1.4	1.1	2.5
5	Circumference of fore cannon-bone	1.9	1.0	2.9
6	» » hind » »	2.5	1.0	3.5
7	Height of pisiform bone	1.8	2.0	3.8
8	Circumference of hock	2.4	1.4	3.8
9	Length of fore hand	2.4	2.2	4.6
10	Front breadth of chest	4.0	2.4	6.4
11	Height of elbow	3.4	3.8	7.2
12	Breadth of chest behind shouldsrs	5.4	2.3	7.7
13	Length of hind hand	4.6	3.6	8.2
14	Height of sternum	3.5	4.7	8.2
15	Height of shoulder joint	3.9	4.5	8.4
16	Breadt of shoulder-blade	4.5	4.3	8.8
17	Length of neck (lower)	6.9	2.3	9.2
18	Height of knee-cap	5.3	5.1	10.4
19	» of ischium	5.4	5.8	11.2
20	Breadth between hip bones	6.9	5.0	11.9
21	Depth of chest	9.6	3.8	13.4
22	Length of barrel	7.6	6.2	13.8
23	Length of neck (upper)	8.2	7.4	15.6
24	Height of ilium	11.2	8.0	19.2
25	» of back	12.7	8.3	21.0
26	» of withers	12.4	9.7	21.1
27	» of croup	13.3	8.9	22.2
28	From point of the shoulder to point of ischium . .	14.5	10.6	25.1
29	Girth	16.7	18.7	35.4

TABLE III.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909 %	in 1909-1910 %	in 1908-1910 %
1	Height of hock	1.2	1.8	3.0
2	From calcaneum to sesamoids	3.4	2.7	6.1
3	From pisiform bone to sesamoids	3.8	2.7	6.5
4	Height of shoulder joint	4.2	4.7	8.9
5	» of pisiform bone	4.3	4.6	8.9
6	» of elbow	4.3	4.9	9.2
7	» of ischium	4.8	5.1	9.9
8	» of sternum	4.8	6.4	11.2
9	» of knee-cap	6.2	6.0	12.2
10	Length of fore hand	8.1	7.4	15.5
11	Height of ilium	9.3	6.6	15.9
12	» of back	10.5	6.9	17.4
13	» of croup	10.5	6.9	17.4
14	» of withers	10.0	7.8	17.8
15	From point of shoulder to point of ischium	12.0	8.7	20.7
16	Front width of chest	13.8	8.2	22.0
17	Length of hind hand	12.6	9.8	22.4
18	» of shoulder-blade	11.9	11.3	23.2
19	» of neck (lower)	18.8	6.3	25.1
20	» of barrel	14.3	11.7	26.0
21	Depth of chest	18.8	7.4	26.2
22	Breadth of chest behind shoulders	20.0	8.5	28.5
23	Upper length of neck	15.1	13.7	28.8
24	Breadth between hips	19.3	14.0	33.3

CATTLE

1176 – Cattle Breeding and its Importance in German East Africa. The Various Breeds of Cattle. — LICHTENHELD, G. in *Der Tropenflanzer*, Year 17, No. 8; pp. 405-430. Berlin, August 1913.

The 2 300 000 head of cattle in German East Africa are very unequally distributed. About one-third of the Protectorate is unsuitable for cattle owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Europe, are zebus. They mostly belong to *Bos zebu africanus*, but some are *B. z. indicus* (called Sokotra cattle by the writer). Among the African zebus, the writer draws a distinction between those with large horns and small humps (Watussi, numbering 750 000) and those with small horns and large humps (Masi, 1 500 000).

I. *The Masai zebus*. — Bred chiefly by the Masai tribe. Colour usually red or yellow and brown, but frequently black or white and grey. Pigmentation generally dark, rarely similar to the coat colour. Skin thick and coarse; hair smooth, short, with a silky lustre. Head small, often hornless, but frequently with short, stout horns bent slightly upwards. Face slightly dished. Ears medium-sized, directed sideways and slightly backwards. Neck of medium length, with the dewlap usually much developed. Withers wide; hump 12 inches high, and usually more developed in the male than in the female. Shoulders sloping and muscular. Chest relatively deep, occasionally somewhat flat. Body barrel shaped. Back and loins of medium length and in a straight line. Croup weak and sloping. Haunches very fleshy. Limbs short, but with small, regular bones. The legs are sometimes crooked, but to no great extent. Tail set on rather low, long and thin, with a large tuft. Hoofs small, hard, and varying in colour from grey to black. Udder small, fleshy, almost hairless, with short, fleshy teats. The size of the animals varies in different localities and attains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 5 ft. or 5ft. 6 in., in height. The best developed animals are usually found in the hot dry district, while the less developed occupy the lower ground.

The Masai zebu matures late; cows do not come into heat until the age of 2 ½ years. The bulls and cows are full grown between 3 ½ and 4 ½ years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather and disease. The calves are subject to Texas fever, which is prevalent throughout the Protectorate and causes 1 per cent. loss, if the animals contract it during the first months of their life. If the disease appears later, the losses can amount to 20 per cent or over. The same occurs in the case of anaplasmosis. Coast fever, in the districts where it is endemic, is responsible on an average for the death of 30 per cent. of the calves; the remainder enjoy life-long immunity; but if this disease is introduced into a hitherto healthy herd, it may carry off 90 per cent. The number of cattle attacked by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually normal, no assistance being needed, and it is followed by no bad after-effects. The milk production is normally below 70 gallons per lactation period, but under favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lbs.; steers of 5 years of age give up to 440 lbs. of beef, and those of 7 years up to 770 lbs. The weight of the hump can attain 24 lbs. The meat contains coarse fibres and is less marbled than that of European breeds. The fat accumulates chiefly below the skin and round the viscera. These zebus are satisfactory draught animals.

II. *The Watussi zebus.* — These are only bred by the Watussi tribe, and are a little smaller than the previously mentioned animals. Coat usually red, brown or yellow. Head and horns longer then in the Masai type. Chest deep, but flat. Line of back and croup straight. Legs often crooked. Milk production twice as large as in the case of the Masai type, but meat production poorer. The animals are less resistant to epidemics and other forms of disease than the Masai zebus ; they cannot stand short rations or want of water as well as the latter. These faults recur in crosses between the two types. The Watussi are also less fertile and develop later than the Masai zebus.

III. *The Sokotra zebus.* — These were introduced direct from India by merchants and are much appreciated for their good milking qualities. They are especially suited to the coast zone, and will, in the opinion of the writer, be still more popular in the future.

IV. *Cattle keeping and breeding by the natives.* — Most of the tribes keep their cattle in the open, but some give them shelter at night. The calves are only put with their mothers for suckling. As the natives milk all the cows the calves generally suffer from under-feeding. The large and the small domestic animals do not graze together. During the rainy season, and for a short time after, the animals are at grass for some hours ; during the dry season, they remain in the field all day. When the natural supplies of water are exhausted, the natives dig wells to obtain drinkable water.

In some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow-house. The natives have no idea of making hay, or of storing fodder for times of dearth. When the grass of a pasture becomes scanty, the native sets forth in search of fresh fields, or sends some of his cattle into good grazing districts, paying in return for the pasturage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are generally chosen for shape, colour and maternal descent, the offspring of good milkers being given the preference. Unsuitable animals are castrated. The proportion of bulls ready for service is about 1 to every 20 cows. The cows are chosen for their good milking properties. A well-proportioned milch cow may be worth as much as three bullocks. As the natives use all their cows for breeding the herds become very heterogeneous. According to the writer, there is no selection of cows for breeding, for the idea is to use all the available animals, and thus increase the size of the herds as much as possible. In order to avoid in-breeding, the native exchanges his breeding animals with those of other cattle owners. The Masai zebus are often crossed with the Watussi, but the offspring produced by crossing these two types with the Sokotra zebu enjoy equal favour. Most of the native tribes still refuse to introduce into their herds European cattle or their hybrids.

V. *Cattle keeping and breeding by Europeans.* — The methods adopted by the Europeans differ little from those which obtain amongst the natives. The chief aim of the European breeders is to have as large herds as possible. As a rule, their herds are less valuable than those of the natives, which is the more to be regretted as they import many bulls from Europe. The writer thinks that it would be best for the European graziers to begin improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resisting the climate and the diseases peculiar to the country. It is true that some success has been attained recently in rendering European cattle immune from the most serious diseases, such as anaplasmosis and Texas fever, but for various reasons, immunisation cannot be practised generally. European cattle if introduced should, according to the writer, be kept in the cow-shed.

Alongside of ordinary farms, where, as on those belonging to the natives, the chief attention is paid to meat production, there are also some dairy farms in the Protectorate. The milch cows on these farms are Sokotras or of European breeds; they are always kept in the stall, and receive in addition to grass and hay "mogo" (1) and oil cakes.

VI. *The value and importance of the cattle.* — The price of a steer yielding 440 lbs. of beef varies from 25*s* to 90*s* according to locality. Cows fetch a quarter or half as much again.

At Daressalam a gallon of milk costs 2*s*; at other places its price is from 2 ½*d* to 10*d*. One pound of fresh butter costs about 3*s* at Daressalam; 1*s* 6*d* at Moschi; 11*d* at Iringa. One pound of "samli" (2) costs 3*d* at the chief places of export.

Until lately, the cattle of German East Africa have been chiefly important as providing food for the native breeder, whose prosperity depends for the most part upon his herds. Recently, however, they have also begun to supply the plantation workers and the town populations. Last year, about 12 000 oxen were sent for slaughter to the districts of Tanga and Wilhelmstal. On the other hand, the writer estimates the number of animals which annually find their way to the market at over 40 000. Considering the small amount of business, and the low price of meat, there is no question of the rational utilization of the cattle. In all breeding districts the overproduction of beef-producing animals is noticed. The writer considers that the best means of preventing a crisis in this direction would be the establishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 1910, 240 in 1911, and 179 during the first half of 1912. As regards "samli",

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(1) This is a tuber of which the feeding value is about equal to that of the potato.

(2) Native-made melted butter.

677 300 lbs. were exported in 1910, 659 500 lbs. in 1911, and 399 600 lbs. during the first half of 1912.

The duty on exported cattle amounted to about £17 000 in 1910 and 1911, and £10 350 during the first half of 1912. The small numbers exported are partly due to the prohibition of the importation of cattle into the neighbouring colonies (except Zanzibar and the Congo) and the law forbidding cows being exported from the Protectorate. As draught animals and producers of manure, the cattle in question are of no interest.

VII. *Methods of improving cattle-breeding.* — The writer is of opinion that it would be worth while to improve the breeds of cattle in German East Africa. In order to do this it would be necessary to improve the management of the animals, abandon the practices which lead to the underfeeding of the calves, not allow the heifers to be served by the bull at such an early age, and diminish the size of the herds kept in districts poor in forage. Hay should also be grown on the farms kept by Europeans, and maize, potatoes, lucerne, etc., cultivated on dairy farms. A better selection of stud animals is very desirable ; in-breeding should be avoided, and only immune bulls used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the purpose of improving the milk production, and considers that such crossing should be practised by the European farmers exclusively.

The article is illustrated with pictures of the animals.

1177 - **Welsh Black Cattle.** — SABORKSY, PAUL in *Mitteilungen der Landwirtschaftliche Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 511-585. Vienna, May 8, 1913.

In a section of his comprehensive work, the writer gives an account of the range of the Welsh Black Cattle and of cattle breeding and agriculture generally in Wales. He then passes on to describe the nature of the skin and coat of the above-mentioned cattle. In section III are given the external measurements of 90 of these animals.

The writer has taken skull measurements according to the Adamerz method. The measurements of 15 typical skulls, of which two are of the South Wales type, are given in section IV. Attention is here drawn to the differences between the two types, which consist chiefly in the form and course of the supra-orbital canals and the lachrymal bone, as well as in the size of the angle of the interparietal bone, the length of the temporal fossa and of the occiput. The mandible, the palatine, the nasal, and other bones in both types show indication of descent from a *brachyceros* type, while the maxilla recalls that of *Bos primigenius.* The skulls from North Wales show more signs of *primigenius* descent than do those from the South part of the Principality. The writer concludes from the measurements that both types are nearly related, but owing to the great differences in the skulls, he thinks they should be regarded from the agricultural standpoint as independent race types. A mixed origin is unlikely. It is certain that the Welsh black cattle, like other old British breeds, are descended from a specific wild type, perhaps a variety or a subspecies of

Bos primigenius, and thus occupy a special position in the stock-breeding system. From the combination of *primigenius* and *brachyceros* characters in the skull, the writer classifies this breed as *pseudoprimigenius*.

1178 – **Carcase Test of the Piedmontese Breed of Cattle** — MASCHERONI, E. in *Cronaca Agricola*, Year XVIII, No. 12. Turin, July 1, 1913.

Though the Piedmontese cattle are considered a general purpose breed (meat, milk and work), nevertheless as producers of meat they are doubtless among the best Italian breeds, if not perhaps the best of all. Formerly this breed contributed largely to the exportation of cattle to France and to Switzerland.

The Piedmontese cattle mature early; frequently it is found that at the age of 18 or 20 months animals of this breed weigh 1320 lbs. and upwards, and at the age of four years considerably above 2 200 lbs. The meat is of excellent quality. The animals are easily fattened without much expense and the percentage of dead weight is high.

Doctor Poli, chief of the Municipal Veterinary Office of Turin, was entrusted by the Ministry of Agriculture, in 1887, with the task of determining the net carcase weights of Piedmontese cattle; from observations made by him it appears that of 31 head of cattle taken at random, 14 gave dead weight percentages ranging between 49 and 55, and 17 above 55; of the latter 9 were above 60 and one reached 66.

1179 – **The Correlation between the Percentage of Milk Fat and the Quantity of Milk Produced by Ayrshire Cows.** — *Journal of the Board of Agriculture*, Vol. XX, No. 5, pp. 447-448. London, August 1913.

An investigation was undertaken by the Board of Agriculture owing to a desire for figures showing as definitely as possible the extent of the correlation between the quantity and quality of milk yielded by a cow. The work of preparing a report on the subject was entrusted to Mr. H. D. Vigor, an Assistant to the Head of the Statistical Branch of the Board. It was thought desirable to include in the calculations such other variable factors as might affect the milk yield of the cow and the percentage of fat contained in the milk, and for this reason it was decided to deal also with the age of the cow, the duration of lactation and the date of calving. The conclusions are derived from data contained in a Report of the Ayrshire Cattle Milk Records Committee.

The conclusions drawn are:

1) After allowance has been made for the varying age and duration of the lactation period of the Ayrshire cows under examination, the milk of cows which gave the larger average weekly yields of milk shows a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields.

2) The duration of lactation had no significant influence upon the average percentage of milk fat produced.

3) The percentage of milk fat showed a slight, but definite, tendency to be lower in the older than in the younger cows, after due allowance has been made for the average weekly yield of milk.

4) Taking the herd as a whole, the duration of the lactation bore no relation to the average weekly yield of milk produced by cows. There is thus no evidence in the case of these cows, of a selective action in favour of retaining in milk those cows that gave a better average yield of milk than others.

5) In the herd under examination, the older cows show a definite and appreciable tendency to give larger yields of milk than the younger cows. This may possibly be due partly to a selective action in weeding out cows which proved unpromising as regards their milk yield when young, and partly to a physiological tendency for older cows to give better yields than younger ones.

6) The duration of lactation has possibly tended to be longer in older than in younger cows, although the evidence on this point is not quite definite.

If it is supposed that the average age and duration of lactation remain unaltered, it appears possible to select a herd with an average yield of nearly 800 gallons per cow per lactation (as compared with the 1909 average yield of 637 gallons), without reducing the average percentage of milk fat produced in the herd as a whole below 3.58 per cent., as compared with the present average of 3.68 per cent. It must be borne in mind, however, that while this result may be regarded as the most probable, in the long run the certainty of attaining it diminishes when only a small number of cows is being dealt with, and increases proportionately with the number of cows in the herd in which the policy of selecting cows with higher milk yields is pursued.

1180 - **Investigations into the Daily Variations in the Specific Gravity and Fat Content of the Milk of a Large Herd** (1). KLOSE in *Bericht über die Tätigkeit des Milchwirtschaftlichen Instituts zu Proskau für das Jahr* 1912-13, pp. 11-12. Oppeln, 1913. *Milchwirtschaftliches Zentralblatt*, Year 42, Part 13, pp. 385-392. Hanover July 1, 1913.

In March, May, July and October, 1912, the writer investigated the specific gravity and fat content of the milk of 70 cows belonging to the herd of the Proskau Dairy Institute. Tests were made thrice daily. These months were selected, as it was important that the period of investigation should include months during which the food was qualitatively the same, and others when the rations varied. The cows' rations in March consisted of hay, straw, brewer's grains, and sunflower and sesame cakes.

In May, the animals received nearly the same food as in March for three days, and then were put out to grass until the end of July. From the 6th of October, the cows grazed half the day, and until October 17, when they returned to the shed, they were given grains, linseed cake, mangolds, straw and hay. From the 17th to the 25th of October the linseed cake was replaced by sunflower cake, and from the 25th to the 31st crushed barley was substituted for concentrated food.

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(1) Ses No. 298, *B.* March 1913. (*Ed.*).

The daily variations in the milk content of each milking (morning, noon and evening), and the variation in the content of each day's milk (the aritmetical mean of the milk of the morning, noon and evening milking) are given in tables. If the results of the different months are compared, it is seen that the greatest variations in the content occurred in the two months March and July, when there was no change in the rations. While in March 18.9 per cent. of the single milkings and 3,3 per cent. of the daily milkings showed a variation in fat content of from 0.2 to 0.45 per cent., in Jult 34.4 per cent. of the former and 23.3 per cent. of the latter showed variations of the same amounts. The greatest variations in fat content were in July, when they reached 0.7 and 0.35 per cent. for single milkings and the day's milk respectively; in March, the highest variations were 0.45 and 0.16 per cent, respectively. In May, the highest variation in the fat content of the single milkings was 0.7 per cent, and that in the days' milk 0.25 per cent. In October, the highest variation in the single milkings was found to be 0.5 per cent, and that in the day's milk 0.26 per cent.

The number of variations in the single milkings were: 17 in March, 27 in May, and 31 in July and October respectively. The greatest variations in fat content in the day's milk occurred in July (during the full grazing season). Next come October and May (when the rations were varied). The day's milk showed least variation in fat content in March (when the rations were always similar).

In glancing over the variations in specific gravity, the similarity of the returns for March and October (when the cows were mostly stall-fed) and those for May and July (when the cows were mostly at grass) is very striking. In March and October, 10 per cent. of all the single milkings varied in specific gravity more than 1 lactodensimeter degree in 24 hours (highest variation 1.9 degree). In May and July, the number of single milkings which attained this amount of variation (highest variation 3.7 degrees) reached 33.3 and 31.1 per cent respectively. In spite of these numerous and large variations in the single milkings, the fat content of the daily milk showed a considerable adjustment of the differences.

The greatest daily variation of specific gravity was in July (0.0037), the smallest in October (0.0015). In March and May the variations did not exceed 0.002. The highest variations which occurred on change of rations were on an average:

Periods	Variations in fat content	Variations in specific gravity (lacto densimeter degrees
—	—	—
May 4-7	0.45	1.2
Oct. 6-8	0.30	0.8
Oct. 17-19	0.25	1.0
Oct. 25-27	0.50	1.1

It is thus evident that the variations in fat content and specific gravity were not much greater when the rations were changed. The writer concludes that the current idea that the variations in fat content of the milk of a large herd fed on approximately similar rations are small, is a fallacy, and that in testing for adulteration, as much stress must be laid upon alterations in the specific gravity of the milk as upon the variation in the fat content.

The writer does not consider that fat content variations of 0.2 per cent, and even up to 0.3 or 0.4 per cent, are alone sufficient to prove adulteration, but they must be accompanied by a difference of 0.002 or more in specific gravity. In passing judgment upon milk from the examination of a sample taken in the shed, the alteration in the specific gravity is the chief point to be noticed. Repeated fat determinations constitute the sole method of judging milk from the butter-making point of view.

1181 – **The Possibility of Increasing, with Economic Advantage, the Average Fat Content of Cow's Milk.** — HANSSON, NILS in *Kungl. Landtbruks- Akademiens Handlingar och Tidskrift*, Year 52, No. 5, p. 289. Stockholm, 1913.

Among the components of milk, fat is the most valuable, both when milk is sold as such and when it is used for butter or cheese making ; thus the eco-

Schematic diagram showing the composition of the dry matter of milk for different fat contents (as abscissae).

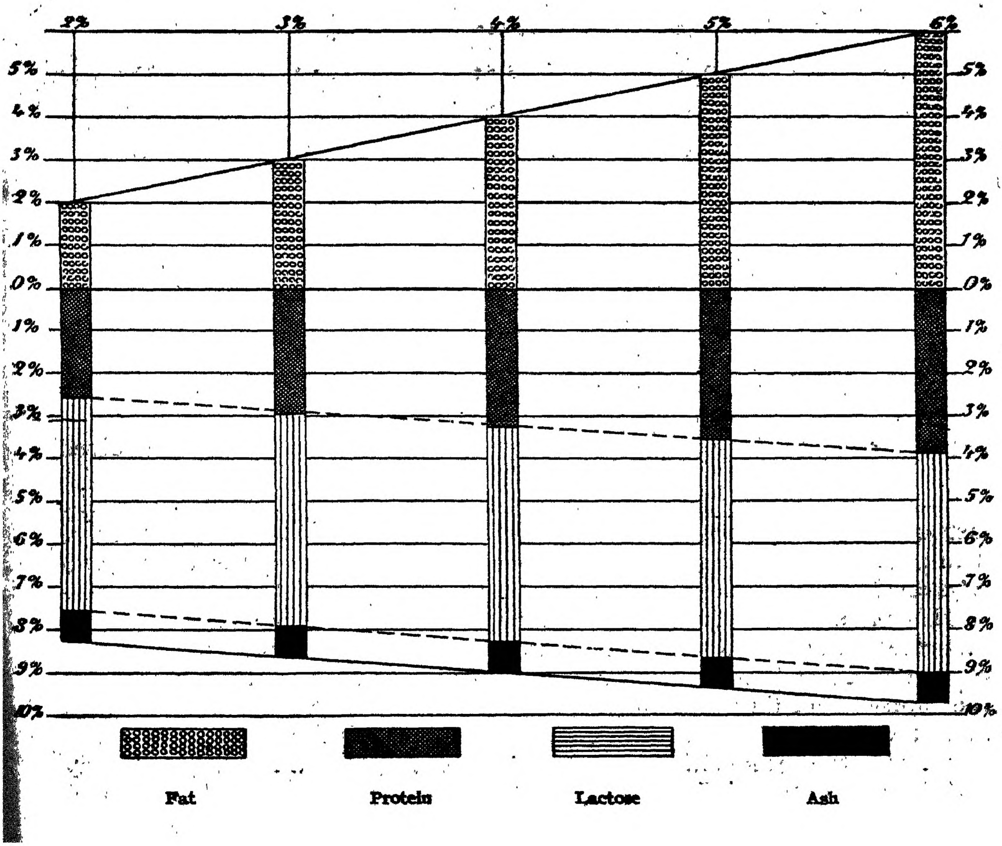

TABLE I. — *Average composition of the dry matter in milk.*

Fat in milk	Solids not fat in milk	Total solids in milk	Fat in the total solids	Solids not fat for 100 lbs. of fat
%	%	%	%	lbs.
2.00	8.31	10.31	19.4	415
2.25	8.46	10.71	21.0	376
2.50	8.51	11.01	22.7	341
2.75	8.57	11.32	24.3	312
3.00	8.72	11.72	25.6	291
3.25	8.83	12.08	26.9	272
3.50	8.96	12.46	28.1	256
3.75	9.05	12.80	29.3	241
4.00	9.16	13.16	30.4	229
4.25	9.29	13.54	31.4	218
4.50	9.30	13.80	32.6	207
4.75	9.30	14.05	33.8	196
5.00	9.33	14.33	34.9	187
5.25	9.37	14.62	35.9	179
5.50	9.36	14.86	37.0	170
5.75	9.34	15.09	38.1	162
6.00	9.31	15.31	39.2	155

nomic importance of producing cheaply a milk rich in fat will be perceived at once.

Without waiting for the theoretical solution of the problem, for the last quarter of a century attempts have been made in Sweden to resolve it in practice. The writer, who is chief of the Animal Husbandry Section of the Central Agricultural Experiment Station of Sweden, discusses in this paper the circumstances which exert an influence on the results, and gives a résumé of what has been obtained up to the present.

In comparing the numerous analyses of milk that have been made in the course of feeding experiments carried out during 13 years at Bonn with those that were made at Tranekjaer and Bregentved in Denmark, the writer found that the composition of the dry matter in milk varies very regularly with its fat content, independently of the breed of cow, of the time elapsed

TABLE II. — *Food required to produce milk richer or poorer in fat, calculated according to the composition of the milk. Average yearly production* 3 300 *kg.* (6600 *lbs.*) *of milk per cow. Live weight* 450 *kg.* (990 *lbs.*).

Fat content of milk %	Food requirement of cow per year — Food units	Food requirements for the production of				
		1 kg. of fat — Food units	100 kg. of milk — Food units	1 kg. of dry matter of the milk		
				Ration of production — Food units	Ration of upkeep — Food units	Total — Food units
2.50	1 909.0	25.5	63.6	2.46	3.32	5.78
2.75	1 955.9	23.7	65.2	—	—	—
3.00	2 002.0	22.2	66.7	2.58	3.11	5.69
3.25	2 048.7	21.0	68.3	—	—	—
3.50	2 095.0	20.0	69.8	2.68	2.93	5.61
3.75	2 145.5	19.0	71.4	—	—	—
4.00	2 188.0	18.2	72.9	2.77	2.77	5.54
4.25	2 234.5	17.5	74.5	—	—	—
4.50	2 281.7	16.9	76.1	2.86	2.65	5.51
4.75	2 329.1	16.3	77.6	—	—	—
5.00	2 376.4	15.8	79.2	2.98	2.55	5.53
5.25	2 423.3	15.4	80.8	—	—	—
5.50	2 471.0	15.9	82.4	3.09	2.46	5.55

since calving, and of the feeding. This is shown by the accompanying diagram and by the figures of Table I, which give the composition of the total solids in milk, and according to which the solids not fat increase with the fat content, but to a lesser extent.

This increase concerns almost exclusively the protein content, which is about one-quarter of the total solids; it does not affect either the lactose or the ash, the quantities of which, according to the analyses used, are almost always constant relatively to the quantity of milk, namely about 5 per cent. of lactose, and 0.7 per cent. of ash.

This signifies that the richer a milk is, the less does the production of solids not fat influence the production of fat.

Taking these ratios of the components of milk as a basis, the influence of the fat content of the milk on the food requirements of the cow has been calculated.

TABLE III. — *Consumption of food for the production of 1 kg. of fat.*

Average fat content of milk of the herds %	Food units per 1 kg. of fat	
	Southern province Malmöhus	Central provinces
2.80 — 2.89	(25.6)	—
2.90 — 2.99	23.4	—
3.00 — 3.09	22.4	—
3.10 — 3.19	21.5	21.5
3.20 — 3.29	21.1	20.8
3.30 — 3.39	20.5	20.1
3.40 — 3.49	20.4	19.7
3.50 — 3.59	19.8	19.3
3.60 — 3.69	19.9	18.7
3.70 — 3.79	18.0	18.5
3.80 — 3.89	17.8	18.4

According to the standard of feeding of cows established by the writer on the basis of the results obtained by the milk control societies, cows require one food unit for the production of 6.6 lbs. of milk. Supposing this standard refers to the production of a milk containing 3.5 per cent. of fat, the food required for the production of milk having another fat content has been calculated by valuing the proteins and lactose as fat according to their calorific value and supposing, with Kellner, that 0.55 lb. of fat corresponds to 2.2 lbs. of starch value (= 1.65 Swedish food units). The result of this calculation (see Table II) is that for the production of 2.2 lbs. of fat the food requirements of the cow diminish, but following a decreasing ratio, with the increase of the fat content of the milk. For the production of 220 lbs. of milk, this requirement increases following a continuous ratio of about 1.5 food units for 0.25 per cent. of the increase of fat content.

This increase of consumption of fodder does not seem to be connected with the quantity of total solids. On the contrary this ratio is almost constant, for if the quantity of fodder required for the production of a certain quantity of solid be divided into its two parts (ration for upkeep and ration for production), it will be found that the increasing amount of fodder required for production, which depends upon the greater calorific value of the fat compared with that of the other components of milk, is balanced by the decreasing quantity required for upkeep distributed over the total solids produced.

This theoretical deduction is further checked by an investigation on the results of the milk control societies. This investigation was made with the object of showing the difference in the consumption of fodder for the production both of 1 kg. of fat and of 100 kg. of milk of varying richness. Table III, which gives the figures for the controlled herds of the most southern province and those of the three central provinces in separate columns, shows the consumption of fodder separately for each herd.

The results are grouped according to the average fat content of the milk.

These figures for 2.75 to 3.75 per cent. of fat correspond as well with those of Table II as among themselves, especially if it be considered that the figures of Table II are calculated for cows weighing 450 kg. (990 lbs.) and yielding exactly 3000 kg. (6600 lbs.) of milk, whilst the figures of Table III refer to cows of varying weights and yields. In this table the figures for the classes of the poorest and of the richest milk are based on so small a number of cows as to have very little value.

The practical results of the control societies thus show, by their agreement with the theoretical deductions, that fat may be produced with a much smaller consumption of fodder in rich milk than in the poorer milk. If the fat content is increased from 3 to 4 per cent., the consumption of food per kg. of fat is reduced by 4 to 4.5 units, that is by about 1.8 per cent. of the quantity of food necessary for the same production in milk containing 3 per cent. of fat. The very small diminution of solids not fat relatively to the quantity of fat which thus results from the increase of the fat, has next to no importance economically owing to the low value of these components.

An increase in the fat content of milk leads to considerable profit in places where milk is used for the manufacture of butter or where it is paid for according to its real value. But for the very frequent cases in which the price of milk is fixed independently of its fat content, it becomes important to know if the production of fat milk requires more fodder than that of poor milk. In order to resolve this question, the writer compared groups of cows yielding milk of different fat content; he has arrived at the results that the consumption of forage per kg. of milk grows proportionally to the fat content. The calculation of this ratio has yielded somewhat variable results, but it may be admitted as an average that an increase of 1 per cent. of fat corresponds to an increase of 6.3 food units for the production of 100 kg. of milk, which agrees with the figures of Table II. For a butter which is paid 2 kroner per kg. (1*s* a lb.) this increase of 1 per cent. of fat in 100 kg. of milk is worth nearly 2.2 kr. (2*s* 5*d*), but 6.3 food units are worth less than 0.7 kr. (9 ¼*d*). It is thus proved that the greater value of the food required for the production of a richer milk does not exceed about 30 per cent. of that of the fat content of the milk. It is thus advantageous to produce a rich milk if it is paid according to its real value. Of course this is not the case when the increase in the fat content of the milk is obtained at the expense of the average quantity of milk, because it is especially upon this that the cost of the production of milk depends.

After having thus treated of the advantage of an increase in the fat content of milk, the writer reviews the means to be adopted to obtain it and the progress which has been hitherto achieved in Sweden. It has been proved, he says, that certain kinds of food, such as palm and coprah cakes and the leaves of beets, have a tendency to increase the fat content of the milk produced, whilst others, such as poppy and German sesame cakes and inferior rice flour, act in the opposite way. Nevertheless it is not by feeding that sure progress is to be expected, but by selection in breeding with this object in view.

This truth has long been recognized in Sweden, but even now the progress has been in general but slight, whilst in Denmark it is very marked. The writer nevertheless mentions some Swedish herds in which a decided progress has been noted during recent years, as is proved by the checked figures of the breeding centre competitions (1). One herd especially, that of Alberga, of Ayrshires, gives a good example and unassailable proofs of the manner in which this progress has been realized.

The writer mentions the Kolle-Kolle herd in Denmark as a famous example of the influence that a bull may have by the capacity of transmitting to the female line a high productiveness of milk rich in fat. The next gives a list of the bulls most employed for the development of the East Friesian breed in Sweden, with notes on the production of milk and of fat in the daughters of these bulls as compared with the production of their dams. He demonstrates that most of these bulls have transmitted to their daughters a productiveness greater than that possessed by their dams. On the other hand some of them have exercised a contrary influence upon the qualities of their descendants.

In order to demonstrate the practical possibility of increasing the production of butter fat by means of the selection of the breeding animals, the writer gives a summary of the development of the Alberga herd and of the choice of the bulls that were used. Thanks to the determinations of the quantity of milk and of its fat content made regularly since 1894 for all the cows of the herd, it has been possible to calculate separately the production of milk and of fat for the groups of descendants of each bull and of each cow.

As for the bulls, five have had a remarkable influence on the development of the herd. If the cows are distributed in families according to the bulls that were their sires, or paternal grandsires, a great difference in the average quantities of milk and butter fat of the different families will be seen. But in order to establish with certainty the influence of each bull upon his offspring, it would be necessary to compare separately the production of each of his daughters with that of their mother, making such comparison at the same age, that is to say for the lactation periods following the first second, third, etc., calving. In this manner the influence of the normal increase of production during the first lactation periods would be eliminated.

This comparison has been possible for only two of the Alberga bulls. For the other three bulls only the average figures for all the years of production of their daughters and of the dams of these were available.

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(1) For the definition of the breeding centre competitions in Sweden, see Dr. ARENANDER's original article: « The Development of Cattle Breeding in Sweden », page 1502 of this *Bulletin* (*Ed.*).

TABLE IV.

Names of bulls	Number of daughters	Controlled during years	Sum of years of control	Average yields		
				Milk kg.	Fat %	Fat kg.
Bill.						
Daughters	61	5.92	361.12	2 545.1	3.70	94.17
Mothers	61	3.59	218.99	2 347.3	3.59	84.31
				+ 197.8	+ 0.11	+ 9.86
Malte.						
Daughters	69	3.78	260.82	2 863.6	3.78	108.31
Mothers	69	3.61	249.09	2 535.1	3.61	91.64
				+ 328.5	+ 0.17	+ 16.67
Farmer's Joy.						
Daughters	26	4.54	118.04	2 811.0	4.01	112.76
Mothers	26	3.70	96.20	2 537.1	3.70	93.92
				+ 273.9	+ 0.31	+ 18.84
Rex.						
Daughters	11	—	37	3 470.1	3.90	135.35
Mothers	11	—	37	2 780.5	3.72	103.47
				+ 689.6	+ 0.18	+ 31.88
King V.						
Daughters	15	—	30	2 672.6	4.30	115.01
Mothers	15	—	30	2 914.2	3.90	113.58
				— 241.6	+ 0.40	+ 1.43

These results of the comparison are shown by the figures of Table IV which give the increase (+) or the decrease (—) of the production of the cows of each family compared to those of their dams.

The five bulls have all of them caused an increase of the fat content of the milk. and four of them have also caused an increase in the quantity of milk produced, but from this point of view the fifth has caused such a decrease that the progress in the production of fat has been almost nil.

Nevertheless, in order to be just in the verdict on the value of a bull for breeding purposes, the productiveness of the cows with which he is mated must be observed. The higher this was, the more difficult it became for the bull to raise it still higher. The writer has illustrated this fact by grouping the dams of each family of a bull according to the fat content of their milk. From this grouping it appears that the poorer the milk of the dams, the more could all the bulls cause the fat contents to rise. In the groups in which the milk was richest two of the bulls have caused the fat content to sink. A bull may thus act favourably on the average fat content of one herd and exert an unfavourable action in another herd in which the faculty of yielding a rich milk is more developed.

Calculating the average fat content of the milk of all the descendants of a bull, the writer has determined the fat content that this bull represents and which he can transmit as inheritance. He calls it " genotype fat content percentage " of the bull.

The writer summarizes as follows the results of his investigations on the influence that the choice of the bulls has on the fat content of the milk :

1. It is possible to increase the percentage of fat content of the milk of a herd, with economic advantage, by a judicious selection of the breeding animals.

2. By dividing a herd into families of descendants of the sires and of the dams, the influence of each animal on the development of the qualities of the herd may be better demonstrated.

3. The influence of the males is demonstrated by the average production of all their female descendants, or still better by a comparison of the average production of their daughters with that of the dams of these daughters when they were of the same age.

4. The influence of the bulls on the percenrage of fat content of the milk of their female descendants depends upon the qualities of the females of the preceding generations.

5. The influence of the cows appears in the fact that a bull possessing a certain genotype percentage of fat cannot increase the percentage of fat in the milk except in the daughters of cows inferior to him in the percentage of fat content, whilst the daughters of the same bull out of cows yielding richer milk will have a percentage of fat inferior to that of their dams.

6. The males and the females transmit to their descendants the percentage of fat which they themselves have inherited from their ancestors, the male and the female having, as it appears, an equal influence on condition that they represent the same constancy of results in this respect. But owing to its larger number of descendants, the male has a greater influence on the development of the herd.

7. Nevertheless, as is usually the case in questions of heredity of quantitative characrers, variations are frequent, so that some particular animals may have an average fat content percentage very different from that of the sire or of the dam ; but the average percentage of all the descendants is in general very near to the average genotype percentage of fat of the sire and of the average fat content of the dam's milk.

8. For the improvement of animals, as well as for that of plants, it must be sought to unite the qualities having the greatest practical value; every effort towards the attainment of such a high yield of milk as would be

injurious to the health of the animals must be carefully avoided, as well as record figures in the butter fat content. But everywhere where milk is paid according to its quality, the object in view should be to combine the efforts in these two directions in order to attain a high production of butter fat.

9. The principal means of increasing the fat content of the milk is a scrupulous selection of the breeding animals, especially of the bulls, judging the genotype percentage of butter fat according to : *a*) the average percentage of the milk of their dams, grandams and sisters ; *b*) the influence of their sires and grandsires on their daughters; and, when the bulls are sufficienty old, *c*) their own influence on the average per centage of butter fat in the milk of their female descendants.

SHEEP

1182 – The Improvement in Sheep-Breeding in Algeria. — COUSTON, F. in *La Revue des Colons de l'Afriqae du Nord,* Year 2, No. 31, pp, 488-490. Algiers, July 31, 1913.

The official statistics give a total of 9 million sheep for Algeria ; of these, one-fifth are found on the sea-coast and the Tell, and four-fifths in the Sahara and the semi-arid plateau steppes. Efforts for improvement must therefore necessarily be devoted to varieties of sheep adapted to the last-mentioned districts. Hitherto, the breed most used for improving the native sheep has been the Rambouillet, although Crau and Spanish Merinos are also imported. So far, no satisfactory results have been obtained. Merinos are not suited to the food and climatic conditions obtaining in Algeria. On the Government sheep-farms at Taadmit, Birin, Ben-Chicao and Moudjbeur, the Rambouillet Merinos die very soon after importation. Their lambs even do not live. The veterinaries and sheep-breeders are therefore of opinion that the Rambouillet sheep is unsuitable to Algeria. The writer has also little hopes of the greater success of the more resistant types such as the Spanish and Crau Merinos. They have shown themselves to have little adaptability, and have only yielded moderately satisfactory results when mated with the native breeds.

According to the writer, the Algerian sheep-breeding industry can only be improved rapidly and economically by means of a rigorous selection of the native breeds. Three of the latter are especially adapted to this end: the Zibran, Hodna and Ouled-Djellal sheep ; they are all hornless, stand 2ft. 8 in. high, and when full-grown give as much as 66 lbs. of mutton. In order to improve the breeds, the writer recommends the careful selection of the best rams, and their distribution by the State to the sheep-breeders·

POULTRY

1183 - Fourth Egg-laying Competition in Tasmania. — Profitable Egg-Production *The Agricultural Gazette of Tasmania,* Vol. XXI, No. 5, p. 184. Hobart, May 1913.

The fourth egg-laying competition, held at Springvale, has recently finished, and it is interesting to note some of the chief features in this connection.

In 1909-10 a pen (6 fowls) of White Leghorns scored highest honours, with a total of 1248 eggs. In 1910-11 Black Orpingtons came to the fore with 1318 to their credit. In the two last competitions White Leghorns have topped the list with 1250 eggs in 1911-12, and for the season just finished 1272 eggs. The all-round average of the birds competing still improves.

Last year it was pointed out that a perusal of the lists of eggs showed that, as compared with previous competitions, there was no "falling away" in the number of eggs laid in respect to pens at the bottom of the list. In the first competition 28 pens competed, and five of these produced less than 800 eggs each. The second event saw the number of pens increase to 32, and six pens fell below 800 each. Last year the competition had 33 pens, and only two of these fell below 800 eggs. This year the three lowest pens recorded 943, 956 and 983 eggs respectively. This means that the lowest pen in the competition averaged over 157 eggs per bird.

Approaching the results arising from this year's work from another standpoint it will be seen that 19 pens out of the 29, or over 70 per cent., recorded more than 1200 eggs per pen, which means that each bird in the pens averaged over 200 eggs. (1). No meat was employed in the diet of the birds competing, but skim-milk and lucerne were provided to furnish protein. The following table shows the first three pen yields and the lowest three for the four competitions at Springvale:

Highest.

1st	year	1248,	1179,	1155;	total:	3582
2nd	»	1318,	1298,	1215;	»	3831
3rd	»	1250,	1201,	1188;	»	3639
4th	»	1272,	1261,	1261;	»	3794

Lowest.

1st	year	670,	654,	410;	total:	1734
2nd	»	661,	614,	614;	»	1889
3rd	»	801,	794,	632;	»	2227
4th	»	983,	956,	943;	»	2882

It is at the tail end where any improvement will be noticeable, and we find that the lowest pen yield in the 4th year more than doubled the number of eggs laid in the corresponding pen entered the first season.

1184 - **Ostrich Farming in Australia.** — HERBERT, T. J. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, No. 6, pp. 511-521. Sydney, June 2, 1913.

Several shipments of ostriches have from time to time been imported into Australia. In 1873 the Melbourne Acclimatization Society imported some; and later, in 1881, Mr. W. Malcolm set about establishing ostrich farming in South Australia, and imported a number of birds. A farm was started at Gawler, and a large number of young ostriches were successfully hatched and reared.

About this time an Act was passed by the South Australian Government, with a view to encouraging the establishment of the industry, by offering the fee-simple of 5000 acres of land to the party who first placed 250 ostriches over one year old upon the land. Mr. Malcolm's venture was formed into a company (the South Australian Ostrich Company), which obtained 5000 acres near Port Augusta under these conditions.

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(1) The grand total of eggs laid by the 29 pens competing was 34137, or an average of 1177 eggs per pen, and as there were six birds per pen the average of each bird stands as high as 196 eggs. No substition of birds was practised in this competition. (*Ed.*).

The country in the neighbourhood of Port Augusta, with an annual average rainfall of only 9 inches, must be classed as inferior pastoral land. Yet the birds have thriven, and a flock of 700 is now pasturing on the farm without any artificial feeding except during the first few months of their lives when they are fed on lucerne and bran. One and a half acres of lucerne are grown and watered from the town water supply. The farm is greatly handicapped by not being able to produce more green fodder; otherwise a greater number of chicks could be reared. The improvement in the plumage brought about by feeding lucerne was strikingly shown when eight birds were sent to Melrose, about 40 miles distant, where they were grazed in a lucerne paddock. The feathers were clipped and sold to a Melbourne manufacturer, realizing £7 per clip per head, or more than double the amount realized from the same birds when grazed on the scantily grassed paddocks at Port Augusta. Birds from the Port Augusta farm have been the origin of almost all the ostriches now pasturing on the various farms throughout the Commonwealth.

In South Australia itself there exists another flock of 400 birds, running on a station near Lake Alexandrina, the nucleus of which came from Port Augusta.

In New South Wales there is a flock of 100 head at South Head, near Sydney, which thrives well, but whose further expansion is limited by lack of space. At Hawkesbury Agricultural College a second flock has been developed from a single pair acquired in 1900, and produces feathers of very high quality.

Another flock was started at Nardoo, near Coonamble, in 1905, with pairs of birds from the South Australian Ostrich Company; the birds now number 550 and it is proposed to increase them still further; 2500 acres are devoted to their use, and the owner of the flock, who also has a 5000-acre sheep run, intimates that he receives greater net profits from the ostriches than from the sheep, though no birds have yet been sold. An artesian well provides abundance of water, and 30 to 40 acres are under lucerne, yielding a cut about every six weeks in summer; this is grown more as a measure of precaution against possible drought than from absolute necessity, for, so far as present experience goes, hand feeding is rarely required. The hay is stored and when fed is chaffed, damped, and mixed with bran or maize. It is estimated that the land will carry 1 bird (or 3 sheep) to every 6 acres, running on natural pasture alone. It will probably prove more profitable to grow fodder, as this would not only increase the carrying capacity of the land, but also raise the quality of the feathers.

The writer has an ostrich farm on the Yanco Irrigation Area; its area is 408 acres, of which 108 are irrigable and destined to lucerne. The flock was built up from birds from the South Australia Co., and at present numbers 90 birds; last year 12 Soudanese ostriches were imported from North Africa to be mated with the South Australian strain.

A flock of 24 adult birds, the progeny of the Hawkesbury College stock, has also been taken to Qeensland, where attention is now being paid to the subject of ostrich raising.

BEES

1185 - **Further Report on the Isle of Wight Bee Disease.** — *Supplement No.* 10 *to the Journal of the Board of Agriculture*. London, July 1913.

This supplement contains a detailed account of the progress of the investigation into the cause of the Isle of Wight Bee Disease. The latter is attended by certain symptoms, such as inability to fly, the presence of numerous bees on the ground in front of the hives, and the dwindling of stocks; many other symptoms have however been recorded, and no one of these is characteristic of the disease. The only essential feature is the death of large numbers of bees, and often of the whole stock, especially during the wet and cold periods of the year, or during the winter months. The disease is probably endemic, but owing to lack of information, it probably often passes unnoticed in mild seasons, the loss of bees being attributed to cold, starvation, spring dwindling, etc.

During the years 1911 and 1912, *Nosema apis* in some stage has been found in almost every stock apparently suffering from the Isle of Wight disease which has been examined, and, moreover, no bacteria other than those found in normal bees have been detected. It can therefore be stated with confidence that *Nosema apis* is the agent responsible for most of the outbreaks in which the symptoms of the Isle of Wight diesease have been noticed, or in which the stocks have dwindled or died without apparent cause.

OTHER LIVE STOCK

1186 - **Domesticated Reindeer in Newfoundland.** — *The Field*, Vol. CXXI, No. 3157 (Supplement). London, June 28, 1913.

Dr. Grenfell, the famous Labrador missionary, has been using reindeer teams for hauling his *kometiks* (sleds) in the various trips he has made from his headquarters at St. Anthony along the coast of northern Newfoundland during the past winter. He speaks most enthusiastically of the reindeer experiment, which has appealed so strongly to the Canadian authorities that the Dominion Department of the Interior purchased 40 of these animals last summer for its own use. They were transported from Newfoundland to Edmonton and thence to the Mackenzie delta to be used by the mounted police for drawing teams in winter, so as to prevent a repetition of the tragedy which attended the effort of Inspector Fitzgerald's patrol to cross the frozen wastes during the winter of 1910-1911.

In the northern part of Newfoundland there are very few horses and dogs for haulage purposes. The same is true of Labrador, where the conditions are even worse, as the Labrador dogs are vicious brutes which attack and devour even human beings. Dr. Grenfell took up the reindeer experiment with the idea of inducing the people to substitute reindeer for dogs as soon as he could supply them with sufficient of the former. Reindeer are also useful in providing milk, which is much needed for the children; as they propagate very rapidly, it is believed that it will be possible in a few years to kill them for food purposes, and thus help to supply the domestic market.

The original herd, consisting of 300 Lapland reindeer, was imported by Dr. Grenfell about five years ago, with a fund of $ 15 000 raised partly in America, and partly in England, with $ 5 000 contributed by the Canadian Government. This herd has increased naturally and now numbers over 1 200 head. One reindeer will do more work than six of the dogs formerly used.

Dr. Grenfell adopted the idea of introducing reindeer into Labrador from the late Dr. Sheldon Jackson, who introduced them into Alaska twenty years ago. The latter, in spite of many difficulties, succeeded in obtaining a certain number of these animals, which by successive additions and natural increase now amount in number to 15 000. The world received an object lesson in 1896 when a number of whaling ships were frozen fast within the Arctic circle and a herd of 500 reindeer were driven 700 miles to supply them with food.

Reindeer can be used as saddle and as pack animals ; they can take 150 to 200 lbs. on their backs. Harnessed to a sled, two of them will pull 500 to 700 lbs. thirty miles daily. Kellman drove his reindeeer express on one occasion 95 miles in one day. At present the most northerly mail route in the world, that between Kotzebue and Barrow, Alaska, a distance of 650 miles, is served by reindeer. No food need be carried for them, as at the end of each day's journey they are unharnessed and at once dig through the snow with their powerful hoofs to the white moss below, which serves them as food.

When Dr. Grenfell began his experiments in Newfoundland, he was fortunate enough to secure the services of Capt. W. C. Lindsay, a retired British Army officer. The latter took over the control of the herd of reindeer, and under his skilful and capable management even better results have been achieved than by the American Government in Alaska. The percentage of living fawns from the Alaskan deer, as given in the Government records, is 40 per cent., whereas at St. Anthony it is nearly 100 per cent. The only trouble that is found at St. Anthony is that the dogs sometimes attack the deer, and the latter in running away over the rough ground often break their legs and have to be killed.

An endeavour was made in the summer of last year to secure a number of young wild caribou to cross with the reindeer, but owing to the plague of flies, which was unusually bad, the idea had to be given up. It is hoped that there will be greater success this year.

The reindeer wandered considerably more last winter than the preceding one ; this was due, in the opinion of the Laplanders, to the fact that the animals have learnt that there are no wolves in the country to fear.

After another season, it is proposed to break up the present large herd, and distribute it among the Mission Stations in Labrador, where, after the process of reproduction has continued for some time longer, the Alaskan practice of lending small herds to the natives to enable them to replace the dogs will probably be adopted.

FARM ENGINEERING.

CULTURAL
CHINERY
AND
LEMENTS

1187 - **Motor Plough Competition at Königsberg.** — MARTINY in *Maschinentechnische Rundschau,* No. 2, pp. 6-9. Königsberg, July 1913.

The Chamber of Agriculture for the province of East Prussia at Königsberg organized a motor plough trial in a field at Löwenhagen near Königsberg on June 4, 1913.

The following motor-ploughs were presented:

The "Ihace": 45 to 60 H. P.; it weighs, with ploughing tackle, 10 tons 16 cwt., and costs £ 1127.

The "Podeus": 65 H. P., weighs, with five-share balance plough, 8 tons 7 cwt., and costs £ 1078.

The "Pöhl" 70 H. P.; it weighs, with plough, 5 tous, and costs £ 833.

The "Arator": 50 H. P.; weighs, with plough, about 5 tons, and costs £ 882.

The "Ergomobil": 30 to 35 H. P.; weighs, with plough, 9 tons 7 cwt., and costs £ 1054.

The "Stock": this costs without reversing gear £ 833; with it £ 882.

The "Wede": 56 H. P.; weighs 5 tons and costs £ 933.

The "Komnick": costs about £ 980, and weighs about 4 tons 5 cwt.

Both the soil and the weather were favourable to the trials. For the shallow ploughing a two-year-old pastured clover ley on mild loam was chosen. For the deeper work, a field dry on the surface and sufficiently moist underneath was used.

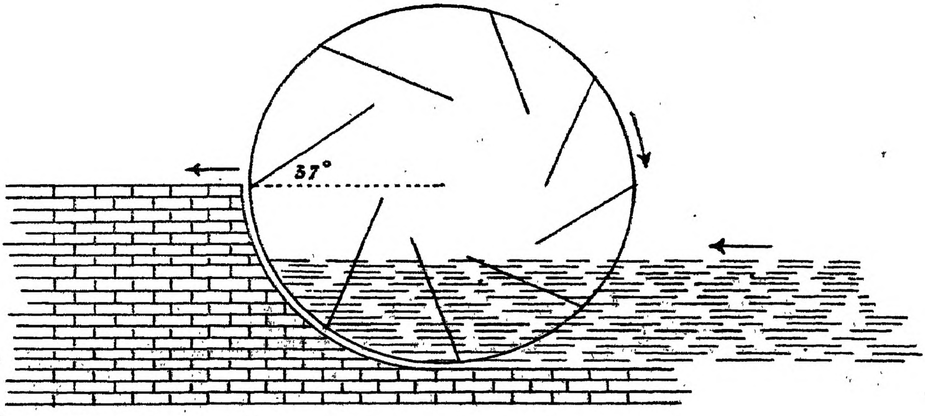
The motor ploughs, thanks to the very favourable soil conditions, worked well. As for the amount of work done, only a few trial tests were made for some of the machines. The results are given in the following table:

Motor plough	Quality of soil	Depth of work	Breadth of work		Speed per second	Area ploughed per hour
		inches	ft.	in.	feet	acres
Ihace	Medium soil	$9\frac{1}{2}$	7	9	2.85	1.36
Arator	»	—	6	7	3.94	1.54
Stock	»	8	6	7	4.26	1.73
Wede	»	8	5	»	3.11	1.11
»	»	$9\frac{1}{2}$	5	»	2.98	1.11
»	Heavy clay soil in good conditon of moisture.	$9\frac{3}{4}$	5	»	3.60	1.30

Lastly the writer discusses the quality of the work performed by each motor plough.

1188 – **An Egyptian Water-lift.** — PARR, A. E. in *The Agricultural Journal of India*, Vol. VIII, Part III, pp. 293-294. Calcutta, July 1913.

"A very useful water-lift for low-lift canal irrigation has recently been received from Egypt. It consists of two circular pieces of iron on an axis about 15 inches apart. These two wheels are connected together by a number of vanes set on at an angle of about 37° to the radius, as in the accompanying drawing. The whole thing revolves in a close-fitting masonry basin. It is geared to run at a slow speed and may be worked by one bullock. The wheel discharges the water at the height of its own axis." The writer recommends it as the best machine he has tried for low lift irrigation.



1189 – **Automatic Drinking Trough** (1) **for Pigs.** — THALLMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No 56, p. 647. Vienna, July 12, 1913.

Automatic drinking troughs for pigs are frequently used, especially in America. A simple form of such a trough is the one shown in the accompanying figure. The trough (T) is provided with a cover (D) under which a float (S) is situated. The lever (H) connects the float with the valve (V). When the trough is used the float sinks and by means of the lever pushes the valve open so that the water from the tank or water-pipe (B) can flow into the trough, through the pipe (R); (mn) is a flange.

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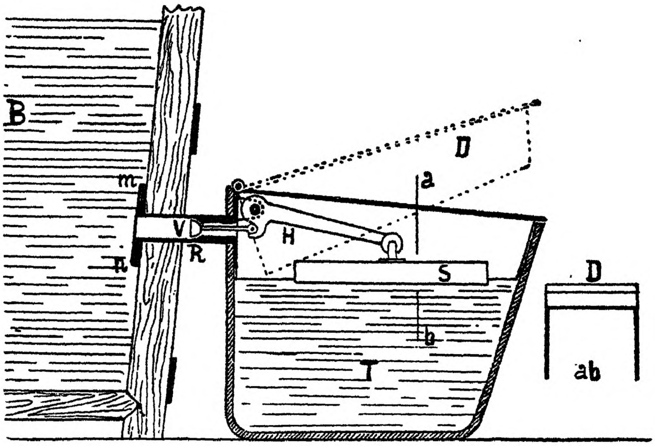
(1) See No. 575, *B.* May 1913. (*Ed.*).

To the right is a section through the cover along the line (ab). The cover (D) is necessary to prevent the animals touching, the float and attached parts with their snouts.



Automatic drinking trough for pigs. Vertical section.

1190 - **A New Apparatus and Method for Milk Sterilization.** — LOBECH, O. in *Molkerei-Zeitung*, Year 27, No. 57, pp. 1105-1106. Hildesheim, July 25, 1913.

As an appendix to an article which has been already mentioned (1), the writer gives a detailed description and diagrams of a complete plant for carrying out the new " Biorisator-Process ".

The principal part of the " Biorisator " apparatus is the so-called " Biorisator " sterilizer. This consists in the main of two cylindrical receptacles placed one within the other. In the inner the milk is reduced to a fine spray. In the space between the two cylinders, the milk is heated. Steam is conducted along a pipe at the side, in order to obtain the necessary heat for the inner cavity, and for the sterilization process. As secondary apparatus may be mentioned a forcing pump, a compressor and a cooler.

The method of working is as follows (see Plate) : The milk in the collector (*a*) is drawn through the pipe (*i*) by means of the forcing pump (*b*) and conveyed by (*k*) to the compressor (*c*). The manometer (*m*) registers the amount of pressure, and the regulator (*d*) carries back by the pipe (*l*) any superfluous milk. The milk is conveyed by the pipe (*o*) from the compressor to the biorisator and issues through fine orifices into the interior of the latter. After having been reduced to spray, the milk flows from the biorisator (*e*) through the pipes (*r*) to the cooler (*f*) and is here cooled as soon as possible down to at least 10° C (50° F.). It then leaves the cooler by

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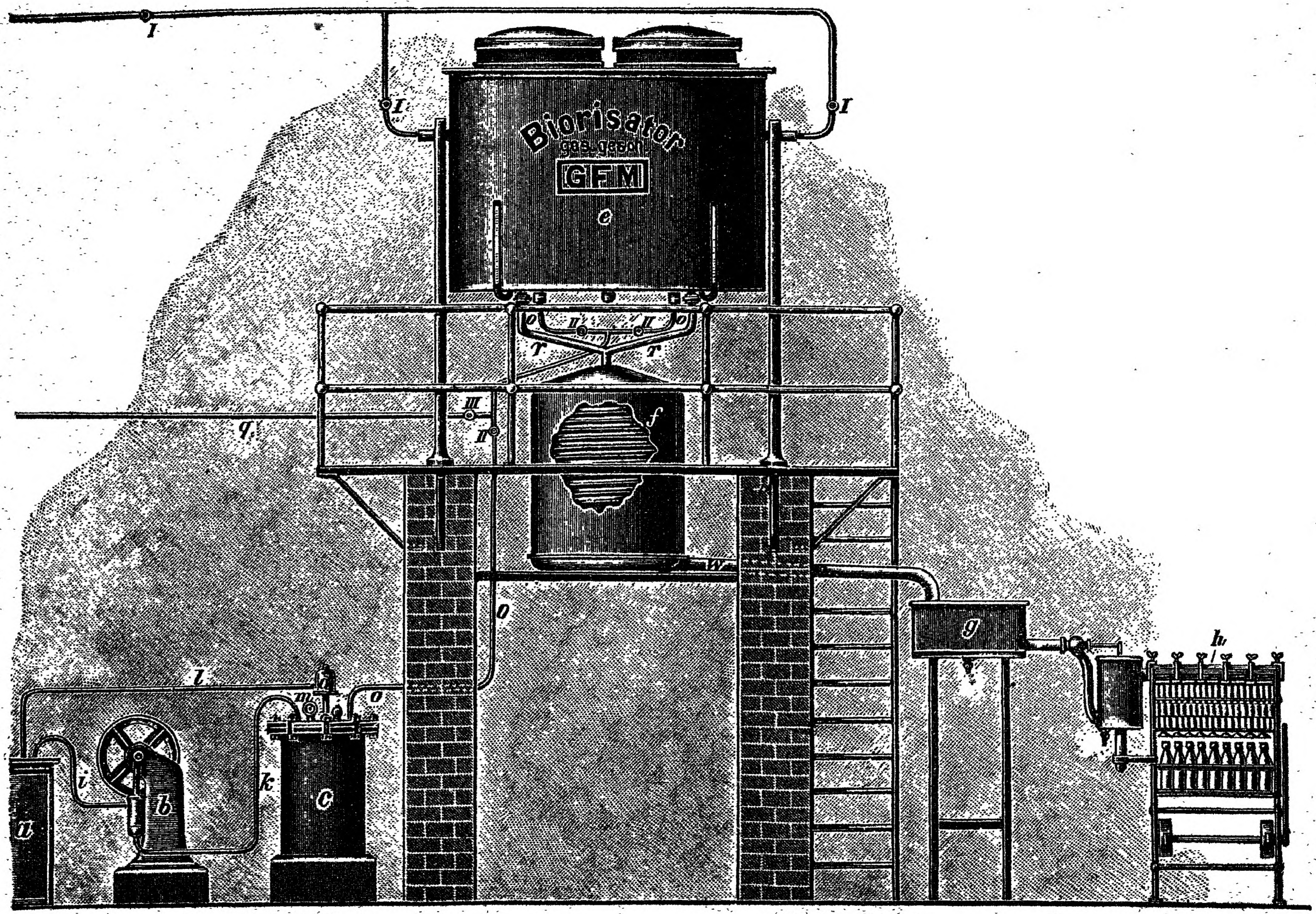
(1) See No. 743, *B*. June 1913. (*Ed.*).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« Biorisator » milk sterilizer.

the pipe (*w*) and flows to the tank (*g*). From here it runs to the bottle-filling machine (*h*), where it is immediately put into bottles.

Before the milk is sterilized, the whole plant is cleaned, either by pumping water through it, or preferably by allowing the water to flow through the supply pipe (*q*) into the biorisator, after closing the milk valve (II) and opening the water valve (III). The necessary heat is obtained by opening the steam valve (I) at the same time. The very hot water flows through the whole plant and sterilizes it. After about 10 minutes, the cooler (*f*) is attached and the water-valve (III) is opened; all the water is drawn off, the temperature is raised to about 75° C. (167° F.) (the heat required for sterilizing the milk), the pump is set going and the milk valve (II) is opened. The apparatus can now work for hours without stopping and only needs occasional attention.

The product obtained by the Biorisator Process is a pure milk, free from bacteria, with the characteristics of raw milk; it is especially suitable for infants. It is also possible to obtain excellent dairy products from this milk, which can be treated just like raw milk.

It was also observed in the dairy that there was no evaporation from the milk, and consequently no decrease in its amount.

RURAL ECONOMICS.

1191 – **Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy.** — SACCHI, G. in *L'Agricoltura italiana*, Year 39, Part 749. Pisa, August 31, 1912.

RURAL ECONOMICS

This is a short study of the commonest forms of land tenure in the plain belt of the Province of Treviso, Italy, which shows how in the same regions there are farms worked by the owners, farms leased and farms held on the share system (metairie). The least frequent form is farming by the owner himself, because, though the estates are prevailingly large or medium sized, the economic unit is the individual farm, varying in extent from 5 to 15 acres. The lands that are managed directly by their owners or their agents are thus either the large estates, and chiefly portions of these that are not divided into farms, or the small holdings of peasant proprietors. The latter are not numerous, but they tend to increase.

The rent is paid partly in cash and partly in kind: that of the arable portion of the farm is given in cash or in kind corresponding to a fixed sum, while the rent of the vineyards and mulberry plantations is paid by half of the produce in kind. Frequently a certain number of days' labour or royalties in kind are included in the rent. This form of leasing prevails on the right of the Piave. The lease is tacitly renewed every year until either of the parties gives notice to the other between March and the 11th of November. Only the farms belonging to charitable foundations are leased, mostly for periods of nine years, for cash only. Metairie, or the half-share system, though not always so simple as in

Tuscany, prevails on the left of the Piave, where the natural fertility of the soil and the just proportion between the available hands and the extent of the farms have been powerful coefficients in the success of this system of tenure, which has led to an advantageous ratio of arable land to plantations of vines, mulberries, etc.

The owner of the land supplies the necessary capital in live stock, he pays one half of the various expenses of production (save labour), the whole of the taxes, and all the cost of new plantations of trees and vines. The expenses caused by the control of fungus pests, as well as the cost of props and wire for the vines, are defrayed in equal shares by the owner and the farmer. The latter, on his side, generally brings into the farm the commonest machines and implements, he provides all the labour and pays house rent, besides giving the owner some royalties in kind and occasionally some days' work and doing some carting for him, especially when the latter manages by himself some small portion of the estate.

The rotation and manuring to be used are determined by the owner. The contract is indefinite and it may come to an end any November provided the necessary notice has been given in the previous March.

1192 – **Persons engaged in Agriculture in Prussia according to the Census of June 12, 1907.** — HAGMANN in *Mitteilungen der Deutschen Landwirtschaftsgesellschaft*, Year XXVIII, Part 34, pp. 483-486. Berlin, August 25, 1913.

For the first time, in 1907, the numbers of persons engaged in agriculture have been registered in the returns of professions and exploitations. The comprehensive results of this census are given in Vol. 212, *2b* of the Statistics of the German Empire, which has recently appeared. Table I gives the numbers of persons engaged in agriculture divided into five classes according to the sizes of the farms.

TABLE I. — *Persons engaged in agriculture.*

Classes according to size	Men	Women	Total	On 100 acres productive area
Under 5 acres. . . .	747 559	1 846 911	2 594 470	105.0
Between 5 and 12 ½ acres	673 416	824 383	1 497 799	35.5
» 12 ½ » 50 »	1 273 995	1 244 343	2 518 338	17.5
» 50 » 250 »	754 476	620 171	1 374 647	8.5
Over 250	602 992	432 278	1 035 270	7.0
For the total area	4 052 438	4 968 086	9 020 524	17.4

TABLE II.

Classes of farms according to size	Managers of farms	Members of family engaged		Hired labour			Temporarily engaged
		Permanently	Temporarily	Foremen and accountants	Permanently engaged		
					servants	day hands	
	1	2	3	4	5	6	7
			a) *Absolute figures :*				
Under 5 acres.	490 762	540 046	1 265 844	1 818	38 802	20 514	236 634
Between 5 and 12 ½ acres . . .	379 077	543 480	343 162	1 423	47 864	18 244	164 549
» 12 ½ and 50 » . . .	541 840	937 164	336 851	3 785	274 873	52 162	371 663
» 50 and 250 » . . .	172 940	278 799	83 272	8 474	405 293	135 537	290 332
Over 250 » . . .	19 363	7 639	3 342	40 627	181 103	459 003	324 193
Totals . . .	1 603 982	2 307 128	2 032 471	56 177	947 935	685 460	2 387 371

b) *Out of every* 100 *persons engaged in agriculture the distribution according to size of farm was:*

	1	2	3	2 and 3	4	5	6	7	4, 5, 6 and 7
Under 5 acres.	18.9	20.8	48.8	69.6	0.1	1.5	0.8	9.1	11.5
Between 5 and 12 ½ acres . . .	25.3	36.3	22.9	59.2	0.1	3.2	1.2	11.0	15.5
» 12 ½ and 50 » . . .	21.5	37.2	13.4	50.6	0.1	10.9	2.1	14.8	27.9
» 50 and 250 » . . .	12.6	20.3	6.0	26.3	0.6	29.5	9.9	21.1	61.1
Over 250 » . . .	1.9	0.7	0.3	1.0	4.0	17.5	44.3	31.3	97.1
On all the farms . . .	17.8	25.6	22.5	48.1	0.6	10.5	7.6	15.4	34.1

In this table are included the persons engaged in forest work on the agricultural areas, but the results are but insignificantly affected by this inclusion.

The preponderance of women in the two classes of smallest area is due to the fact that in the small farms the work is for the most part done by the holders themselves with the members of their families, especially the women folk (wives, and daughters).

As for the *intensity of the work*, an idea can be gained when the number of persons engaged per area of 100 acres is considered. It appears that the number of persons engaged diminishes with the increase of the area of the holding. In these figures, however, the real numbers of workers do not appear with exactitude, because in the smaller and middle sized farms there are persons returned as present whose work is only partially or not at all devoted to farming. The real numbers of workers in the classes of the smaller holdings are in reality smaller than those returned.

Acording to the position held in the farms, the statistics distinguish between: *managers, members of the family* and *labourers.*

The numbers of persons in Prussia on June 11, 1907, belonging to these three groups are shown in Table II.

From the above figures it appears that in the whole State the persons employed in agriculture are to the extent of about two-thirds members of the holders' family and one-third hired labourers. The ratio between the members of the holders' family and the strangers varies of course considerably according to the size of the farm. In the smaller-sized holdings the holders and the members of their families prevail; namely for the smallest holdings they are 88.5 per cent., for small farms 84.5 per cent., for medium-sized farms 72.1 per cent. and for large estates a very low percentage. The reverse is the case with hired labour. In the smallest farms it is employed very sparingly, in medium-sized farms it is 27.9 per cent. of the total, and in large estates it attains to 97.1 per cent.

Table II shows the character of the agricultural working population. The members of the holders' families are divided into two main groups: those who are permanently employed on the farms and those only temporarily engaged; more than half of the members of families belong to the first group. Their number increases generally with the size of the farm, whilst the temporarily engaged members are found in the greatest numbers in the smallest holdings. In these, during ordinary periods but a small amount of labour is required, and during the short periods in which there is much work to be done the members of the holders' families assist. Hired labour is divided into overseers and accountants, permanently (farm servants and maids, and day labourers) and temporarily engaged hands. To the latter belong especially non-resident hands.

The first group is an exceedingly small one. The greatest part is formed by the permanent labourers, among whom there are more farm servants and maids than day labourers. In each of the classes according to size of farm the distribution of these labourers varies greatly. The proportion of farm servants and maids increases with the size of the farm, but diminishes again in the largest farms, in which the greatest contingent is that of day labourers.

This distribution of agricultural labour is of the greatest importance for the study of the labour question. The large estates are especially affected by the want of permanent hands. A sufficient number of farm servants and maids is a vital necessity for large estates, for without them the regular work of the farm cannot be carried on. This is seen also from the distribution of permanent and temporary hired labourers. The latter are relatively more numerous in the smaller holdings and diminish with the increase in the size of the farm.

The small holdings are in a position to attract outside labourers during the busiest periods of the year, when the assistance of the members of the family is insufficient or not available. For the larger farms a staff of permanent labourers is absolutely necessary, because they cannot, like the smaller ones, avail themselves during the busy time of the temporarily disengaged hands.

The work of children, that is persons under the age of fourteen, is, as may be seen from Table III, an important factor.

TABLE III.

		Numbers of children employed	Numbers of children among 100 persons employed in the corresponding class
Members of the farmer's family	permanently	35 531	1.54
	temporarily	225 732	11.10
Outside labour	permanently	32 150	2.32
	temporarily	54 714	3.24

Lastly the following average figures for the kingdom of Prussia are given as to the sizes of the farms.

	Percentage of area
Farms under 12.5 acres	12.9
» between 12.5 and 50 acres	27.7
» » 50 » 250 »	31.3
» over 250 » »	28.1

The following figures show the percentage of productive land occupied by various crops:

	per cent.
Cereals	48.4
Forage crops	25.8
Potatoes and beets	12.6

The average number of persons engaged on 100 acres of productive land in Prussia is 17.4.

1193 - **The Farmer's Income in the United States.** — SPILLMAN, W. J. in *United States Department of Agriculture, Bureau of Plant Industry, Circular* No. 132, pp. 3-7. Washington, July 19, 1913.

The data upon which this article is based are obtained from the census of 1910, combined with certain factors worked out in the experience of the Office of Farm Management in conducting farm management surveys.

There are two items of income about which no information is available, *viz.* the value of the milk and cream consumed on the farm, and what the farmer earns for work outside his farm; and one item of expenditure which cannot be determined, *viz.* the amount paid for live stock. The data presented in the accompanying table should be interpreted in the light of these omissions.

The average area of the American farm in 1910 was 138.1 acres, 75.2 acres of which are classed as improved land and 49.77 acres as devoted to crops. The total average investment per farm is $6 443.67, the amount in farm buildings being $ 994.33 and that in implements and machinery $ 198.88.

All the data for the receipts as given in the table were obtained from census returns. The farm is also credited with the total value of all the crops produced except that part fed to live stock, which is obtained by deducting the value of forage sold from the total value of the forage crops. The farm is thus credited with the butter, cheese, eggs, poultry, honey, meat, fruits, vegetables, bread, etc., consumed on the farm where it is produced, and the value thus consumed on the farm is included in the farm income.

Any revenue from outside sources should be added to the net income given in Table I.

The expenses for labour, fertilisers and fodder are obtained from the census returns also. The cost of maintenance of farm buildings is placed at 5 per cent. of their value, and that of implements and machinery (including repairs) at 20 per cent. of their cash value, both figures being based on extensive investigations by the Office of Farm Management, and agreeing with the estimates in Warren's " Farm Management ". Taxes are assumed to be 0.6 per cent. as an average for the whole country.

The remaining items of expense in the conduct of a farm are collectively calculated as 15 per cent. of other expenditure, which is the average obtained from a number of farm management surveys conducted by the Office of Farm Management. The total farm expenses, omitting the item of live stock purchased, amount to $340.15.

The farm income is obtained by deducting the total expenses from the total receipts, and amounts to $640.40. Assuming 5 per cent. as the rate of interest to which the farm investment (of $ 6 443.67) is entitled, the farm income is then distributed between interest and labour income as follows: Interest on investment, $ 322.18; labour income $ 318.22.

The average farm mortgage based on the number of all farms, is $1 715, which at 6 per cent. per annum amounts to $102.90. Deducting this amount from the farm income of $ 640.40 we get $537.50 (to which must be

TABLE. — *Labour income of farmers in the United States.*

Item			Total	Amount per farm
Number of farms			6 361 502	—
Improved land acres.			478 451 750	75.2
Total farm investment			$ 40 991 449 090	$ 6 443.67
Investment in farm buildings			$ 6 325 451 528	$ 994.33
Investment in implemants and machinery			$ 1 265 149 783	$ 198.88
Receipts.				
Dairy products (excluding milk and cream used at home)			596 413 463	$ 93.75
Wool			65 472 328	10.29
Mohair			901 597	0.14
Eggs produced			306 688 960	48.21
Poultry raised			202 506 272	31.83
Honey and wax			5 992 083	0.94
Domestic animals sold			1 562 936 694	245.69
Domestic animals slaughtered			270 238 793	42.48
Total value of all crops		$ 5 487 161 223		
Corn	1 438 583 919			
Oats	414 697 422			
Barley	92 458 571			
Hay, etc.	824 004 877			
Total value of crops used for feeding.	2 769 714 789			
Feed sold	509 253 522			
Net value of crops fed		2 260 461 267		
Net value of crops			3 226 699 956	507.22
Total gross farm income. . .			6 237 850 146	980.55
Expenses.				
Labour			$ 651 611 287	$ 102.43
Fertilisers			114 882 541	18.06
Feed			299 839 857	47.13
Maintenance of buildings (at 5 %)			316 272 576	49.72
Maintenance of implements and machinery (20 %)			253 029 956	39.78
Taxes (0.6 %)			245 947 694	38.66
Total			1 881 584 911	295.78
Miscellaneous expenses (15 % of other expenses)			282 237 736	44.37
Total expenses			2 163 822 647	340.15
Summary.				
Total gross income			$ 6 237 850 146	$ 980.55
Total expenses			2 163 822 647	340.15
Net farm income			4 074 027 499	640.40
Interest on investment (at 5 %)			2 049 572 454	322.18
Labour income			2 024 455 045	318.22
Interest on mortgage ($ 1 715 at 6 %)				102.90
Available for purchase of live stock and for family living				537.50

added the value of milk and cream consumed on the farm and any outside income) as the sum to be used in the purchase of live stock, in living expenses, and in savings.

As the majority of farmers are capitalists, the interest on capital constitutes part of the income and the labour income is undoubtedly smaller than it would be if the farmer did not also have the interest on his capital. Thus, we find that in the better agricultural sections, the labour income of tenants is considerably higher than that of farmers who work their own farms, though the latter may have larger total incomes than the tenants. In fact a large number of American farmers live on the interest of their investment and do not receive anything for their own wages. But this is not possible on the small farm, where the interest is too small to admit a high standard of living, and the farmer must have some labour income in addition.

In America it is reasonable to infer that at least half the farm families of the country have incomes smaller than those given in Table I. Individual farmers here and there have larger incomes than this average, but the facts presented in the table indicate that on the whole the income of farmers in this country, even when we include as a part of the income those things consumed on the farm where they are produced, is certainly not more than sufficient to pay 5 per cent. on the investment and ordinary farm wages for the labour they do, and it is probably considerably less than this.

1194 - **Notes on Tobacco-Growing in Germany.** — LANG, H. Einiges aus dem Gebiet der deutschen Tabakstatistik. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 12, pp. 409-426. Stuttgart, June 13, 1913.

The number of German tobacco-growers has much decreased during the last 20 years, for while in the five years 1891-1895 there were 151 390 persons growing this crop in the district under the jurisdiction of the German Customs, the figures for the subsequent periods of five years were as follows:

1896-1900 : 136 352
1901-1905 : 108 606
1906-1910 : 95 369

The tobacco growers have thus progressively decreased in the proportion 100 : 90.1 : 71.7 : 62.9. The following table gives the details of this decrease in the principal tobacco-producing districts of Germany:

Years	Prussia			Baden			Bavaria	Alsace-Lorraine	Wurtemburg
	Number of planters	in % of the total number of the Empire	in % of the numbers of the first 5 years' period	Number of planters	in % of the total number of the Empire	in % of the numbers of the first five years	Number of planters in % of the numbers of the first five years' period		
1891-1895	82 962	54.8	100	37 469	24.8	100	100	100	100
1896-1900	68 444	50.2	82.5	39 125	28.7	104.4	91.4	89.2	112.2
1901-1905	49 445	45.5	59.6	34 694	31.9	92.6	83.0	71.7	89.0
1906-1910	37 582	39.5	45.3	34 316	36.0	91.6	79.9	64.9	103.2

The area cultivated by each tobacco-grower has, however, considerably increased, and consequently the total area under tobacco has decreased in a proportion very different from that in which the number of cultivators has diminished. The cultivated area was as follows:

1891-1895	43 021 acres
1896-1900	44 748 »
1901-1905	39 908 »
1906-1910	37 647 »

The decrease occurred in the following proportion 100 : 104.0 : 92.7 : 87.5. The increase or decrease of the area under tobacco in the various districts is shown by the following table.

TABLE II.

Years	In % of the total under tobacco in the Empire		In % of the area under tobacco in the different districts during the first five years.					
	Prussia	Baden	Prussia	Baden	Bavaria	Alsace-Lorraine	Wurtemburg	Hesse
1891–1895 . . .	29.2	39.9	100	100	100	100	100	100
1896–1900 . . .	29.8	41.2	106.3	107.5	94.8	102.0	105.5	95.7
1901–1905 . . .	29.1	41.0	92.6	95.4	88.8	96.4	80.5	83.4
1906–1910 . . .	25.8	43.3	77.3	95.0	85.5	101.7	85.8	83.8

In consequence of the decrease in the area under tobacco, and owing to the fact that the yield per acre has rather diminished than increased, the total production of tobacco, after a temporary rise in the second five-year period, fell considerably in the two succeeding five-year periods, as is shown by the following figures:

	Amount of tobacco gathered (dry)	
	Absolute amount	Relative amount in % of the first five-year period
1891-1895	722 767	100
1896-1900	742 320	102.9
1901-1905	695 382	96.2
1906-1910	599 049	82.9

The proportions for the various States are given in Table III.

TABLE III.

	Prussia	Baden	Bavaria	Alsace-Lorraine
1891-1895	100	100	100	100
1896-1900	96.8	109.0	98.1	104.0
1901-1905	90.2	100.8	95.5	100.7
1906-1910	74.0	86.7	83.8	97.2

While the production decreases, the price of tobacco rises, and as this latter movement is relatively stronger than the former, the result is an increase in the total value of the crops.

TABLE IV.

	Total value of annual tobacco crop in Germany £	General movement	Increase and decrease in the various States					
			Prussia	Baden	Bavaria	Alsace-Lorraine	Wurtemburg	Hesse
1891-1895	1 434 097	100	100	100	100	100	100	100
1896-1900	1 484 798	103.5	94.4	112.2	101.8	103.0	99.5	87.4
1901-1905	1 436 863	100.1	90.7	105.0	103.2	109.7	90.1	87.8
1906-1910	1 536 658	107.1	92.2	112.8	114.2	129.3	109.3	86.0

The average crop per surface unit has, on the whole, remained about the same; it was as follows per acre throughout the Empire:

1901-1905	16.81 cwt.
1906-1900	16.61 »
1901-1905	17.44 »
1906-1910	15.93 «

Great variations have been found in the yield per acre in different districts. If the average crop in each period of five years is taken at 100, the yield per acre is as given in Table V.

TABLE V.

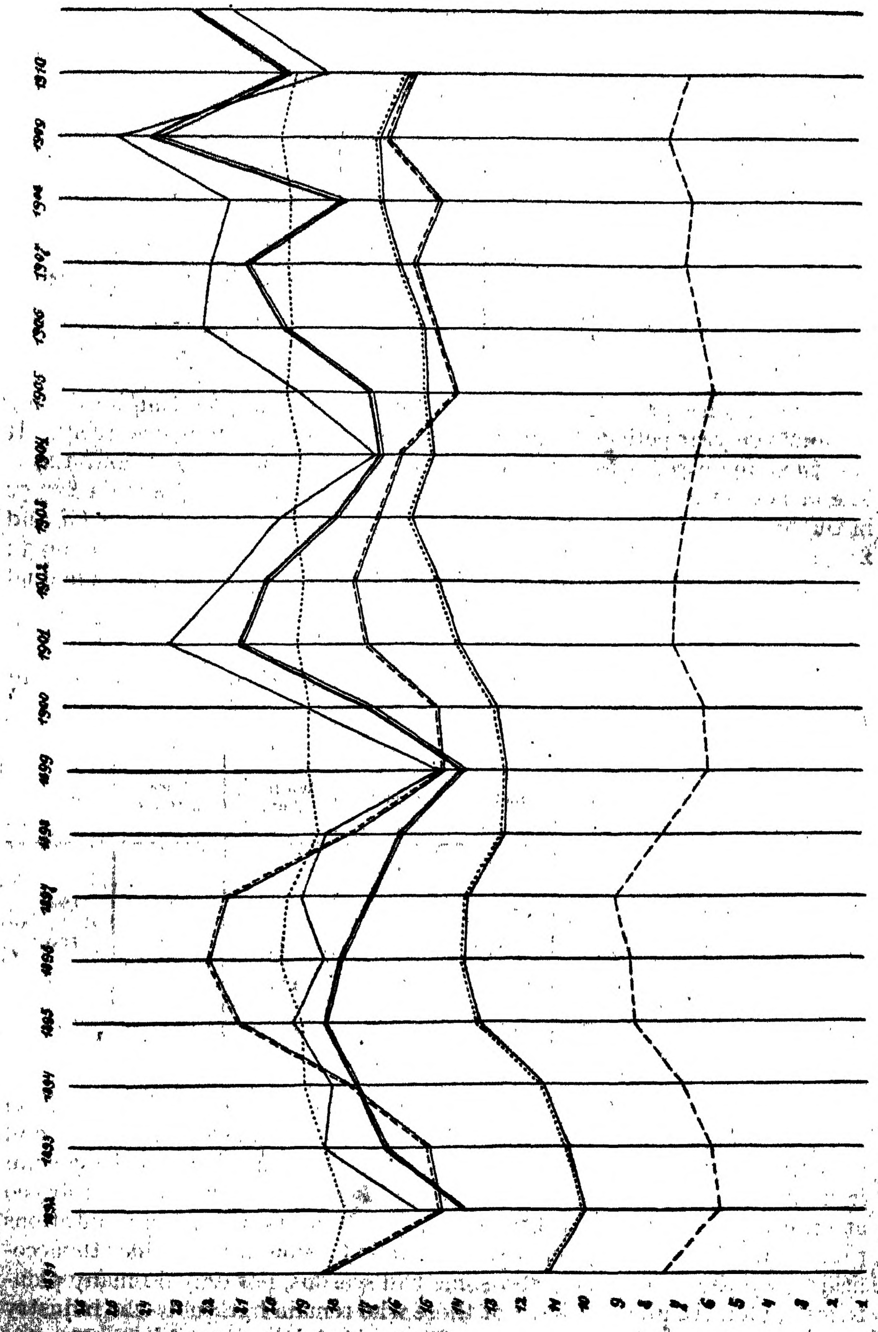
	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1891-1895 . . .	96.9	102.3	as a rule from 6 to 10 % below the average for the Empire	102.3	124.4	80.2
1896-1900 . . .	90.3	105.6		104.9	128.7	79.5
1901-1905 . . .	91.1	104.6		107.1	126.8	84.4
1906-1910 . . .	98.6	99.5		109.4	127.2	77.0

The average price of tobacco has risen thoughout the Empire during the four five-year periods to 39*s* 8*d*, 40*s*, 41*s* 3*d*, and 51*s* 3*d* respectively. It has thus increased proportionately from 100 to 100.9, 104.1 and 129.1. The money return per acre has also notably increased. It rose from £33 7*s* in the first five-year period, and £33 3*s* 9*d* in the second, to £36 0*s* 6*d* and £40 16*s* 6*d* in the two last periods. The proportion is thus 100 : 99.5 : 107.9 : 122.3. ~~Nevertheless, the different States have taken very unequal~~ parts in this development, as is shown by Table VI.

TABLE VI. — *Value of the crop per surface unit in % of the value of the first five-year period.*

	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1891-1895	100	100	100	100	100	100
1896-1900	88.7	104.2	107.3	94.3	101.0	100.3
1901-1905	97.8	110.0	116.5	111.9	113.6	123.0
1906-1910	119.1	118.7	133.7	127.1	127.0	133.1

The value of the tobacco produced per surface unit varies much from one year to another; these fluctuations not only cause uncertainty and anxiety to the growers, but have a considerable influence upon the general initiative of the planters. After some good seasons, the area under tobacco at once increases, not only because new cultivators add fresh plantations to those already existing, but also from an extension of the former tobacco-fields. On the other hand, after some bad seasons, not only do many planters abandon the undertaking, but those who remain faithful to the industry reduce the area under cultivation. The writer gives a graphic representa-



Fluctuations of the returns from 1 hectare of tobacco in the German Empire and in the Grand Duchy of Baden from 1891 to 1910.
(For explanation, see text, p. 1627).

tion of this movement in the German Empire and the Grand Duchy of Baden. (The double lines refer to the former, and the single lines to the latter). The graphic curve gives the amount realized each year by the tobacco yield of one hectare (2.47 acres): the figures at the extreme left each represent 100 marks (about £5). The two curves referring to the Empire and the Grand Duchy of Baden (continuous lines) are displaced by a column — that is to say by a year — towards the right. This is done in order to show more clearly that the crop obtained one year has an undoubted effect upon the area placed under tobacco the next year, and that this occurs with the utmost regularity. As for the area under tobacco in any given year (broken lines), the figures on the extreme left each represent 1000 ha. (2470 acres), while in the case of the figures relating to the area cultivated by each planter (dotted lines), every figure represents one are (4 rods).

AGRICULTURAL INDUSTRIES.

1195 – A Practical Formula for the Calculation of the Solids not Fat in Milk. — HÖYBERG, M. H. in *Zeitschrift für Fleisch- und Milch-hygiene*, Year 23, Part 23, pp. 539-541. Berlin, September 1, 1913.

DAIRYING

The formula given by the writer is based upon the same principle as that of Bertschinger, viz:

$$\text{Solids not fat} = \frac{\text{degree of lactodensimeter} + \text{percentage of fat}}{4}$$

If, for instance, the specific gravity of the milk is 1.034 and the fat content 2.8 per cent, the solids not fat $= \frac{34.0 + 2.8}{4} = 9.2$.

This formula has the advantages of being simple and accurate, and of giving quick results.

Also, as is seen by the experimental data reproduced in Tables I, II, and III (1), it is superior to Ackermann's automatic calculator, and especially adapted for testing doubtful milk.

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(1) The Tables 1 and 2 are reproduced in a slightly abridged form. (*Ed.*).

TABLE I. — *Results obtained from samples of doubtful milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat: according to chemical analysis	according to the new formula	according to Ackermann's automatic calculator
1	1.0270	2.38	7.34	7.34	7.47
3	1.0300	2.70	8.07	8.17	8.30
4	1.0257	3.00	7.11	7.17	7.27
6	1.0312	2.24	8.43	8.36	8.49
8	1.0326	2.02	8.68	8.65	8.85
9	1.0293	3.08	8.05	8.09	8.20
11	1.0257	2.71	7.25	7.10	7.21
12	1.0275	2.79	7.41	7.57	7.68
14	1.0295	2.21	8.02	7.92	8.06
16	1.0268	2.66	7.17	7.36	7.48
17	1.0308	2.26	8.41	8.26	8.39
19	1.0287	2.38	7.34	7.77	7.90
20	1.0292	2.64	7.79	7.96	8.08
22	1.0296	2.40	7.83	8.00	8.13
24	1.0292	2.16	7.63	7.84	7.98

TABLE II. — *Results obtained from samples of normal milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat: according to chemical analysis	according to the new formula	according to Ackermann's automatic calculator
1	1.0330	3.44	9.12	9.11	9.19
3	1.0320	4.14	9.06	9.03	9.07
4	1.0315	4.19	8.96	8.92	8.96
6	1.0330	3.04	9.06	9 01	9.12
7	1.0320	3.23	8.77	8.80	8.91
9	1.0310	3.27	8.47	8.56	8.78
11	1.0315	3.21	8.83	8.67	8.77
12	1.0325	3.38	9.10	8.97	8.76
14	1.0315	3.21	8.83	8.67	8.77
15	1.0320	2.97	8.98	8.74	8.85
16	1.0320	3.14	9.02	8.78	8.90
17	1.0320	3.00	9.02	8.75	8.85
18	1.0320	3.22	8.51	8.80	8.91
20	1.0320	3.51	8.59	8.87	8.05

TABLE III. — *Results obtained with samples of half milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat	
			according to chemical analysis	according to the new formula
1	1.0288	0.89	7.45	7.41
2	1.0342	0.91	8.72	8.77
3	1.0340	0.97	8.35	8.74
4	1.0262	0.88	6.66	6.67
5	1.0292	0.94	7.58	7.53
6	1.0349	0.90	8.91	8.95
7	1.0362	1.05	9.11	9.31

1196 — **The Specific Gravity of Cow's Milk and the Change it Undergoes Shortly After Milking.** — FLEISCHMANN and WIEGNER in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 283-323. Berlin, July 21, 1913.

Quévenne, the inventor of the lactodensimeter, had already observed that in the course of the first 4 to 6 hours subsequent to milking, the specific gravity of cow's milk increased on the average 0.0008 to 0.0015, when it was kept at a temperature below 30°C. Opinions have hitherto been much divided as to the causes of this property possessed by milk. Quévenne, and later Reiss and Sommerfeld, thought that this increase in specific gravity occurred through the volatilization, immediately after milking, of the gases present in solution in the milk. Bouchardat considered the increase in specific gravity to be due to a molecular change in the structure of the sugar of milk. Other investigators attributed the phenomenon to a specific movement of the fat globules. Recknagel, Kirchner and Fleischmann considered that the casein globules expanded further. Lately, the alteration in the volume of the fat globules has often been cited as the cause of the change in the specific gravity of milk. So far, however, the literature dealing with the subject has furnished no reliable data based on accurate investigations.

The writers have subjected to rigorous examination all the accounts of the experiments hitherto made to elucidate this cicumstance, and, to the same end have themselves carried out exhaustive investigations in the Laboratory of Milk Chemistry at the Göttingen University. The results prove that the hypothesis of gas volatilization does not explain the phenomenon. No alteration in the milk sugar or movement of the globules, such as could increase the specific gravity, was observed. No support was found for the theory of the expansion of the casein globules which was put forward by Recknagel. The writers, however, observed the existence of a certain inter relation between increased specific gravity and the presence of fat globules. When, for instance, the milk was kept for 22 hours at the same temperature as at the moment of milking, no increase in specific gravity was noticed. The specific gravity of milk which had been recently milked and then cooled down to 3°C., increased 0.0015; on the milk being subsequently warmed up to 45°C., the specific gravity sank to what it was before. Skimmed milk did not increase in specific gravity even after a longer time, or after having been cooled to a lower temperature. The larger the fat content, the higher the increase in specific gravity if the milk was kept below the melting point of the butter fat. Kept at body heat, milk with a high or with a low fat content underwent no change in its specific gravity. Solidified butter fat possesses a higher specific gravity than liquid butter fat. The specific gravity of emulsions of fat and water is less than that of fat.

The temperature oscillations of the milk globules were produced with the same rapidity as those of the milk plasma. The writers have come to the conclusion, as a result of their researches, that the increase in specific gravity which occurs in the case of milk which has recently been milked, is due to the coagulation of the fat globules present.

1197 – **Practical Methods for the Determination of Fat in Cheeses. Comparison of the Methods in Use, with Special Regard to the New Processes of Kooper and Wendler.** — HERRAMHOF, H. in *Molkerei-Zeitung*, Year 27, No. 54, pp. 1053-1054. Hildesheim, July 16. 1913.

The writer speaks of the methods most usually employed for the determination of the fat in cheese, *viz.* those of Siegfeld and Gerber; he compares them with Kooper and Wendler's methods and gives the results of comparative experiments, comparing the data thus obtained with the results of the Bondzinski-Radzlaff method. He thus shows, that for the analysis of cheese rich in fatty matter, the Siegfeld method and those of Kooper and Wendler are as suitable, and give almost as accurate results, as the Bondzinski-Radzlaff process. The Kooper method is the one most adapted for the estimation of fatty matter in cheeses which are poor in fat.

MEAT INDUSTRY

1198 – **The Consumption of Meat and Milk in Japan in 1911.** — *The Annual Repor of the Central Sanitary Bureau of the Imperial Japanese Government for the* 44th *Year o Meiji* (1911), pp. III + 73 + 172 + 106. Tokyo, 1913.

The number of slaughter-houses existing at the end of 1911 was 495, of which 219 were public, and 276 private. The number of animals slaughtered is given in Table I:

The average annual consumption of meat per inhabitant in 1911 was 2.74 lbs.

The number of animals prohibited to be slaughtered after examination was 460 bullocks, 46 calves, 54 pigs and 316 horses. The number of animals ordered to be entirely thrown away after slaughtering was 193 bullocks, 6 calves, 47 pigs and 17 horses, while that of those of which only parts were thrown away was 5165 bullocks, 92 calves, 2296 pigs and 1181 horses. Besides these there were some cases where the viscera only were ordered to be thrown away.

Table I.

	No. of animals slaughtered	Weight of meat — lbs.	Average weigth of meat per animal — lbs.
Bullocks	262 588	97 640 000	371.84
Calves	21 858	2 395 600	109.60
Sheep and goats	2 488	24 350	25.73
Pigs	198 423	23 415 500	118.01
Horses	66 555	16 527 500	248.33

At the end of 1911, there were in Japan 5691 dairy-farms; these had produced during the year 10 113 000 gallons of milk, which corresponds to an annual consumption per head of 1 ½ pint. Compared with the previous year, there was an increase of 2.6 per cent. in the number of dairies, and of 9.8 per cent. in the production of cow's milk. The prefectures of Kyoto, Tottori, and Kagoshima produced 7 460 gallons of goat's milk, that is four times as much as in the preceding year. There were 47 condensed milk factories, which turned out 1 480 000 lbs.

Table II gives the amount of milk and of condensed milk produced in the chief dairy prefectures.

Prefecture	Milk — galls	Condensed milk — lb.
Tokyo	1 748 000	70 250
Osaka	655 000	17 930
Hyogo	432 700	2,740
Gumma	241 900	156 250
Chiba	110 900	273 850
Aichi	491 100	—
Shizuoka	331 800	663 800
Yamaguchi	163 550	122 500
Hokkaido	461 400	131 500

WOOL INDUSTRY

1199 – **Annual Wool Review for Australasia.** — *Dalgety's Review* (*Australasia*). *Annual Wool Number* 1913, p. 83. Sydney, July 1, 1913.

The total quantity of wool of Australasia exported has been 2 247 265 bales or 721 821 516 lbs., as against 2 537 867 bales or 840 694 748 lbs. in 1911-12. To arrive at the actual production it is necessary to add the amount of wool used by manufacturers in Australasia, namely, 87 775 bales or 28 175 775 lbs. The result shows the actual production of wool for the past twelve months to have been 2 335 040 bales or 749 997 291 lbs., as against 2 637 127 bales or 873 549 808 lbs. in 1911-12.

The average weight per bale of the past clip as dealt with in Australasian markets is 321.2 lbs., as against 331.2 lbs. for the previous year, 332.1 lbs. for 1910-11, 335.5 lbs. in 1909-10, 330.6 lbs. in 1908-9, 333.7 lbs. in 1907-8, and 339.7 lbs. in 1906-7.

It will be seen that the decreased average weight of the bales during the past wool year has been 10 lbs., whilst compared with six years ago the decrease in weight is no less than 19.7 lbs.

Sheep numbers as at the close of the year show the very serious falling off of 9 809 634 head, as compared with the same point twelve months ago, and it will take a succession of good seasons to regain the lost ground. Details as to the number for each State compared with those returned at the end of the two preceding years are shown in Table I.

TABLE I.

States	1912	1911	1910
New South Wales	39 436 118	45 032 022	45 825 308
Victoria	11 892 224	13 857 804	12 937 983
Queensland	20 248 580	20 387 838	20 153 239
South Australia	5 481 487	6 267 477	6 432 038
West Australia	4 593 458	5 408 583	5 157 658
Tasmania	1 800 000	1 788 310	1 735 000
Commonwealth	83 451 867	92 742 034	92 241 226
New Zealand	23 750 153	24 269 620	23 792 947
Australasia	107 202 020	117 011 654	116 034 173

The average price per bale realised for the 1 804 801 bales sold in Australasian markets has been £13 13*s* 1*d*, which compares with £11 15*s* 5*d* in 1911-12, £ 12 10s 4d in 1910-11, £13 12s 2d in 1909-10, and £ 12 9s 0d for the past thirteen years.

The value of the clip sold in Australasia during the past year has amounted to £ 24 642 643, whereas during the previous year 1 926 926 bales realised £22 682 090, and in 1910-11 the 1 865 167 bales sold realised £23 346 602. The average number of bales sold in the Australasian markets during the past seven years has been 1 719 066, and the average realisation £22 086 002 per annum.

The past clip was composed of 69 per cent. merino, and 31 per cent. crossbred, a slight increase in the proportion of crossbred as compared with the previous year, when the respective proportions were 72 and 28 per cent. The clip of 1910-11 was composed of 76 per cent. merino, and 24 per cent. crossbred, while in 1908-9 there was 78 per cent. of merino and 22 per cent. of crossbred.

The comparative failure of the 1912 lambing is revealed by the quantity of lambs' wool sold in Australasia during the past twelve months, which amounted to 65 106 bales, as compared with 93 050 bales for the preceding season, 98 314 bales for 1910-11, 108 808 bales in 1909-10, 69 456 bales in 1908-9, and 70 980 bales in 1907-8. The proportion of lambs' to fleece was 4 per cent., as compared with 5 per cent. for the two preceding years, and 6 per cent., 4 per cent., 5 per cent., and 7 per cent. respectively for the four years before that date.

The quantity of scoured wool sold in Australasian markets has been 149 611 bales, or 8 per cent. of the total wool sold, which compares with 144 046 bales, or 7 per cent., in 1911-12; 160 326 bales, or 9 per cent., in 1910-11; 195 241 bales, or 10 per cent., in 1909-10; and 177 877 bales, or 11 per cent., in 1908-9.

VARIOUS

1200 – **Experimental Contributions on the Subject of the Disinfection of Hides and Fleeces containing Anthrax Spores.** — Sévcik in *Zeitschrift für Infektionskrankheiten, Parasitäre Krankheiten und Hygiene der Haustiere,* Vol. 13, Part 6, pp. 322-348; Part 7, pp. 429-452. Berlin, June and July 1913.

An account of culture experiments and experiments on animals undertaken for the purpose of testing the methods adopted by Seymour-Jones and Schattenfroh for the disinfection of hides and fleeces containing anthrax spores.

It was shown that a 0.02 per cent. solution of sublimate, as recommended by Seymour-Jones for dried sheep-skins and large hides, is unreliable, and that ox-hides, even if placed in a solution of sublimate ten times as strong and left there for 48 hours, are not necessarily free from infection.

Schattenfroh's method was perfectly satisfactory for the sterilization of guinea-pig and rabbit skins, but was not efficacious in the case of ox-hides and grease-free sheep-skins. On account of its cheapness and the small amount of danger it entails, this system is to be recommended for the sterilization of small skins.

WINE-MAKING

1201 – Notes on the Vine-Growing Districts of Chile (1). CANU, G. (Director of the Oenological Station of Chile) in *Annales de la Science Agronomique*, Year 30, No. 5, pp. 351-365. Paris, May 1913.

Vine-growing is one of the most ancient and most important industries of Chile.

Conditions of vine-cultivation. — A large portion of Chile lies between the 30th and 38th degrees of south latitude which delimit the area which is essentially suitable to vine cultivation. This area is bounded on the east by the Andes, while on the west, the temperature is regulated by the presence of the Pacific Ocean. This vast zone enjoys an exceptional climate and is free from hail storms. The rainy season coincides with the winter, the long summer is hot and dry, spring frosts are rare, and cryptogamic diseases infrequent. *Oidium* exists, but though sulphur dustings are often carelessly carried out, this fungus does little harm. Mildew is practically non-existent. On the other hand, anthracnose has made its appearance in several departments. Further, *Conchylis ambiguella, Haltica ampelophaga, Eudemis* (*Polychrosis*) *botrana* and *Oenophtira pilleriana* are unknown in Chile, though other parasites exist there, such as *Phytoptus vitis, Tetranychus* sp., *Tylenchus* sp. and even *Margarodes viticum.* To all the other advantages Chile possesses should be added a plentiful supply of water, at least in the valleys where most of the vineyards are situated. The streams descending in large numbers from the Andes permit of the systematic irrigation of the vines according to the requirements of the different vineyards.

Methods of vine-growing and wine-making. — These vary according to the several zones. If the old vines of the country, owing to their thick planting, do not receive all the attention they require, the new French vines, which are planted in lines and supported by iron wire, are, as a rule, carefully tended as regards the cleanliness of the soil, and are systematically pruned. Further, while the cellars belonging to the old Spanish vineyards are nearly all badly constructed and provided with very primitive plant, those properties are numerous where the cellars are carefully made and are furnished with all the appliances which are requisite for handling the crop and for subsequent work in the cellar.

The Wine-making Station of Chile has greatly contributed to the improvement of the methods of work, by its critical studies of the native wines, its repeated advice, and by the publication of numerous installation plans. Further, by means of lectures held on the spot in the different vine-growing regions, and an incessant propaganda, it encourages and promotes industrial methods of wine-making.

Chilian wines — From certain French vines, *viz.* Cabernet, Merlot, Cot, Verdot, there are produced in the neighbourhood of Santiago, especially in the "Llano de Maipo" and the "Llano Subercaseux", full-bodied red wines, of relatively good quality and bouquet, which resemble Bordeaux and work up fairly quickly, but improve little on keeping. From Pinot-noir when gathered before it is over-ripe, and treated with care, relatively light wines are produced; these are good in quality and have a delicate flavour, somewhat resembling Burgundies.

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(1) See No. 1638, *B.* Dec. 1912. (*Ed.*).

Speaking generally, in the same zone, the white wines are inferior to the red; Sémillon, in particular, is nearly always deficient in mellowness. On the other hand, some cellars produce from Pinot-blanc a very mellow wine with a pleasant bouquet. Some experiments should be mentioned which were made with wines resembling certain types of Sauternais. By these it was proved that with a little method and perseverance it is possible to obtain wines possessing bouquet and preserving a certain amount of aroma. The following table gives the analyses of wines made from different vines, for the purpose of determining a few of the chemical characteristics of these products. The wines analysed were new, as a rule.

TABLE I. — *Wines from the neighbourhood of Santiago.*

Composition	Cabernet	Pinot	Merlot	Verdot	Romano	Sémillon	Sauvignon	Pinot blanc	Folle blanche
Density	995.2	995.4	994.7	994.8	995.6	992.0	992.0	991.4	995.8
Alcohol per cent. in vol.	11.8	12.5	12.2	11.0	12.4	12.1	10.9	12.0	10.4
Extract at 100°, per 1000	24.34	26.12	22.18	17.44	26.66	16.68	12.2	13.04	21.00
Reducing substances in glucose per 1000 . .	2.17	2.47	2.17	1.92	2.97	1.92	0.78	1.43	1.78
Sulphates in Potassium sulphates, per 1000 .	0.55	0.54	0.39	0.33	0.37	0.40	0.32	0.37	0.59
Cream of tartar per 1000	3.06	2.46	3.13	3.57	3.81	2.53	3.13	1.78	3.96
Mineral matters p. 1000	2.42	2.56	2.82	1.96	1.44	1.50	1.36	1.48	2.04
Total acidity in H_2SO_4 per 1000.	2.94	4.13	3.80	4.04	4.86	4.74	4.09	3.76	5.45
Volatile acidity, in $C_2H_4O_2$ per 1000 . .	0.31	0.49	0.30	0.39	0.40	0.34	0.74	0.82	0.67

Another important vine-growing zone is that of "Lontué" and "Talca." The crops are often larger than those in the neighbouthood of Santiago, especially in the first of the above localities. The wines are less alcoholic and poorer in dry extract ; they are also inferior in quality. Table II contains some types of analyses of the wines of this district.

TABLE II. — *Lontué Wines.*

	Cabernet	Pinot	Cot	Merlot	Sémillon	Pinot blanc
Density	944.5	993.4	994.3	995.4	993.0	994.3
Alcohol per cent. in vol.	11.8	11.9	11.2	11.2	12.7	11.7
Extract at 100°, per 1000	21.12	16.78	20.34	22.90	19.40	20.34
Reducing substances, in glucose per 1000	1.66	1.85	1.47	0.78	2.25	2.27
Sulphates, in potassium sulphate per 1000	0.35	0.34	0.30	0.49	0.33	0.32
Cream of tartar per 1000	3.65	2.61	3.21	3.43	2.53	3.57
Mineral substances per 1000	2.30	2.04	2.42	2.70	1.24	—
Total acidity, in H_2SO_4 per 1000	3.92	3.19	3.35	4.53	4.11	3.56
Volatile acidity, in $C_2H_4O_2$ per 1000	0.41	0.32	0.35	0.79	0.30	0.32

TABLE III. — *Wines of the Coast Cordilleras.*

	Red wines of the country — Provinces of			Sémillon	White wines of the country — Provinces of		
	Linares	Maules	Concepcion		Linares	Maules	Concepcion
Density	995.2	997.5	996.1	991.2	993.0	996.4	993.8
Alcohol per cent. in vol.	10.9	12.2	9.2	11.4	11.8	10.3	11.9
Dry extract at 100°, per 1000	19.74	28.68	17.84	23.35	14.50	21.00	18.60
Reducing substances, in glucose per 1000	1.41	4.34	1.85	1.07	1.78	1.85	3.42
Sulphates, in potassium sulphate per 1000	0.45	0.31	0.24	0.22	0.20	0.25	0.30
Potassium bitartrate per 1000	4.03	4.40	2.33	2.68	2.91	3.28	2.76
Mineral substances per 1000	2.80	3.12	2.92	1.40	1.92	2.48	1.45
Total acidity, in H_2SO_4 per 1000	3.68	3.56	2.21	3.60	3.35	4.04	3.68
Volatile acidity, in $C_2H_4O_2$ per 1000	0.54	0.56	0.85	0.47	0.74	0.52	0.98

The district producing inferior wines is chiefly that known as the Coast Cordillera, which includes the provinces of Linares, Macule and Concepcion. Generally it is the hill slopes that are planted with vines; these vineyards are not watered, as the rainy season in this part is prolonged till sufficiently late into the spring. French vines are here relatively rare, the old Spanish varieties being still cultivated. They yield larger crops than the French vines, but the wines made from their grapes are flat, without freshness or bouquet. Table III gives some examples of the composition of these wines. The samples were taken from new wines before the first racking.

Specialities. — To the north of Santiago, in the Provinces of Aconcuagua and Coquimbo, the crop is used for the elaboration of special products, "chichas", liqueurs, raisins and brandy. "Chicha" is an exclusively Chilian product; it is grape-juice concentrated at 12°, 13° and 14° Baumé by being placed over an open fire out of doors, and then left to ferment spontaneously. This agreeable beverage is sold when it sparkles slightly and has lost some of its sweetness, but has not yet acquired a high alcohol content. "Chicha" is made throughout Chile, but this northern zone with its different grapes (Alexandrian Muscats, white, yellow, rose, golden, and other Muscats, Torontes, etc.) produces a kind which is especially prized.

TABLE IV. — *Composition of Chichas.*

	Santiago	Buin	Naucagua	Cauquenes	La Calera
Density	1 036.4	1 057.5	1 027.6	1 040.0	1 080.0
Alcohol per cent. in vol.	7.2	6.5	9.0	10.1	3.0
Dry extract at 100°, per 1000	114.30	—	—	179.90	217.80
Reducing substances, in glucose per 1000	95.6	117.60	84.4	171.00	207.00
Glucose per 1000	53.7	87.37	64.35	93.60	127.90
Levulose per 1000	41.9	30.23	20.05	77.40	79.10
Mineral substances per 1000	2.24	2.32	2.10	2.06	7.62
Cream of tartar per 1000	3.13	4.12	3.73	4.78	6.51
Tartaric acid per 1000	0.85	1.29	0.96	0.72	1.03
Total acidity, in H_2SO_4 per 1000	3.84	4.28	4.21	4.82	5.46

The sweet wines and liqueur wines produced in the Province of Coquimbo are not without their good qualities. Aromatic brandies known as "piscos" are also made in this district.

Raisins. — In Huasco and Elqui, raisins are made from Alexandrian Muscats grown on trellises on the slopes at an altitude of from 3 300 to 5000 ft. The climate there is particularly dry and warm. The grapes are gathered when fully ripe. They are hung up in special rooms, where they dry by the action of the natural circulation of the air. In two months, the grapes are dry; they are then passed through boiling water for one or two minutes, and are subsequently drained, dried and packed.

Area under wines, and vine production. — The area planted in vines may be estimated at 250 000 acres; the vineyards are nearly equally divided into irrigated and non-irrigated plantations. The so-called native vines occupy a surface of 160 500 acres, as against 56 500 acres planted with French varieties. The average production is about 154 million gallons for the whole number of vineyards.

Consumption and exportation. — At the present time, the Chilian wines are mostly consumed in the country. But it is interesting to note that there is also a considerable exportation of liqueur wines to Germany. Wines of a good brand are those chiefly exported to Uruguay, Argentina, Peru, Bolivia and Brazil.

The value of the vines. — The value of the vineyards per acre, in the irrigated zones, amounts as a rule to from £80 to £128 according to the district, the quality of the soil, distance from the railway, etc. In non-irrigated zones, the value varies between £16 and £32.

1202 – The Wines of Tokay and a Comparison with those of Sauternes.

— LABORDE, J. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1024, pp. 129-135. Paris, July 31, 1913.

The temperate district of Tokay-Hegyalja, in Hungary, is noted for a very excellent liqueur wine prepared from more or less shrivelled grapes, not attacked by *Botrytis cinerea* ("Edelfäulniss" (1).

Producing district. — The district of Tokay-Hegyalja, the Côte d'Or of Hungary, is situated in the North-East of the kingdom in the County of Zemplén, comprising some 30 communes including these of Tokay; to these must be added one commune in the County of Abanj-Torna thus making 31 communes.

Tokay-Hegyalja is a range of hills extending from the extremity of the great plain of Hungary some distance from the Carpathians, for some 30 miles, and containing an area of 12 450 acres of land occupied by 5 708 cultivators.

The total production of this area averages about 1 760 000 gallons, and occasionally reaches 2 640 000 gals. Of this total only about one half to one third reaches the high quality required for export, and of the exported wine 95 to 98 per cent. is of the Szamorodni or Maslás brand; the Asszu wine makes up the remaining 2 to 5 per cent., the real essence of Tokay being very rare.

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(1) See No. 418 *B*. April 1913. (*Ed.*).

The principal vine grown in Hegyalja is the Furmint, of which there are several varieties, all thick-skinned fruit free from moulds and suitable for making dried grapes. Amongst the varieties of Furmint are the following: Raisin Blanc, Muscat Jaune (which gives the celebrated Asszu de Muscat), Lime Leaf, Goat's Udder. They all ripen early; in good seasons some grapes begin to colour at the end of July, and all are ripe in September.

All qualities of wine are made in this district, from the ordinary Tokay wines to the rare Essence.

Ordinary wines. — These are made from bunches containing no shrivelled grapes, or from which the shrivelled ones have been removed; although ordinary table wines, they have a very rich flavour.

Essence of Tokay. — The shrivelled grapes are gathered separately and placed in a vat having a small outlet at the bottom; through this flows out a very concentrated juice, obtained by the pressure of the grapes themselves. This juice gives the Essence of Tokay, which is very rich in sugar, but contains little alcohol; in time it takes on a very marked aroma and an exquisite flavour; it is always rare.

Asszu wine. — This is the best-known of the Tokay wines, and is much appreciated as a dessert wine. It is prepared from a mixture of shrivelled and unshrivelled grapes; the greater the proportion of the former, the richer the wine. For a very sweet wine, 5 hottes (2 to 3 ½ bushels) of shrivelled grapes are added to one barrel (28 to 30 gallons) of must. Asszü wines are classed according to the number (2, 3, 4 or 5) of hottes of shrivelled grapes added to each barrel of must. The shrivelled grapes are first of all crushed alone in a vat and the resulting mass is thrown into another vat, mixed with the correct amount of must and stirred vigoronsly; it is set aside for 12 to 48 hours according to the temperature, after which it is put into bags, trodden, and pressed; then the juice drawn off is put into casks.

Forditás. — The residue from the bags is placed in another vat and a further quantity of common must is added. After thorough mixing, the whole is left together for 4 or 5 hours, and is then put into bags and trodden. The residue is then pressed and a liquid obtained which produces a very good wine but of less value han Asszu.

Szamorodni Wine. — This is prepared from bunches whose grapes are partly shrivelled; they are trodden in bags and treated in much the same way as for Asszu. The residue is used in the making of Forditás.

Máslás wine. — To prepare this, good Hegyalja wine is poured onto the lees remaining after drawing off the Asszü or Szamorodni wines. In this way the wine remaining in the lees is used to improve the ordinary table wines.

Composition of the Must and the Wine. — Table I gives the composition of a sample of 1906 must (density = 1,113) from the vineyard of Kincsen (Tolcsva).

TABLE I.

		Grams per 100 c.c. of must.
Extract		29.41
Reducing Sugar	levulose	13.46
	glucose	12.94
Total acidity (as tartaric acid)		0.80
Total tartaric acid		0.547
Acid other than tartaric		0.007
Cream of tartar		0.404
Tartrates of alkaline-earths		0.217
Ash		0.290
Phosphoric acid		0.069
Polarimetric rotation		12.12°

TABLE II. — *Composition of shrivelled grapes from the same vineyard in the same year.*

		per 100 kg.
Skins (moist)		5.633
Seeds		6.083
Water		6.083
Extract		63.550
Sugar	levulose	26.676
	glucose	26.299
Extract (sugar free)		10.299
Total acidity (as tartaric acid)		1.605
Free tartaric acid		0.00
Tartar		2.281
Ash		1.681
Phosphoric acid (P_2O_5)		0.148

Fermentation of the Must. — The fermentation of the must in the Tokay Hegyalja districts, is generaly catried out in cold cellars, so that the musts of high sugar content ferment slowly. The wines are thus made slowly, and keep on improving in delivacy and aroma for years.

The Asszű wines of Tokay vary in colour from golden yellow to brown. They have a peculiar sweetness resembling that of honey, and very characteristic flavour and aroma. The Szamorodin wines are generally not sweet or only slightly so; they have considerable strength, a yellow or yellowish brown colour and a very characteristic flavour. They contain 13 to 17 per cent. of alcohol, while the Asszű wines, being much sweeter, contain only 10 to 13 per cent.

Comparison of the wines of Tokay with those of Sauternes. — Table IV gives the anlayses of representative types of the wines of Tokay and enables us to make comparisons with the white wines of Sauternes made by different methods.

TABLE III. — *Composition of wines of Tokay (Kramszky) in grams per 100 c.c.*

	Ordinary wine of Tokay-Hegyalja from Tarczal, 1901	Szamorodni from Sarospatak 1901	Asszú wine (5hottes) from Tarczal, 1901	Asszú wine (5hottes) from Tallya, 1890	Essence from Tolcsva, 1901
Alcohol: Volume per cent.	14.39	14.77	12.23	13.13	7.11
Alcohol	11.42	11.72	9.70	10.42	5.64
Acidity, total ($C_4H_6O_6$)	0.76	0.94	0.96	0.62	1.23
Acidity, volatile ($C_2H_4O_6$)	0.13	0.10	0.15	—	0.21
Acidity, fixed ($C_4H_6O_6$)	0.60	0.82	0.77	—	0.97
Extract	3.16	7.78	18.74	9.26	33.73
Reducing bodies	0.29	2.60	13.40	5.75	25.77
Levulose	0.16	1.82	6.85	2.88	13.90
Dextrose	0.03	0.68	6.45	2.77	11.87
Glycerine	1.08	1.48	1.80	—	1.45
Tartaric acid, total	0.28	0.19	0.19	—	0.15
Tartaric acid, free	0.08	0.00	0.00	—	0.00
Tartrates of alkaline earths.	0.07	0.16	0.13	—	0.05
Tartar	0.16	0.04	0.09	—	0.13
Tannin	0.02	0.015	0.03	—	0.024
Ash	0.16	0.185	0.24	0.20	0.30
Phosphoric acid	0.028	0.042	0.062	0.045	0.041
Polarimetric rotation	—0.14°	—1.38°	— 3.15°	—1.30°	—7.04°

Comparison of the Tokay wines with those of Sauternes. — The analyses of these various wines allow a comparison to be made between those of the Tokay district in general and the famous white wines of Sauternes, of which the method of preparation is quite different. Table IV contains analyses of some types making a series as similar as possible to the Tokay series in sugar and alcohol content. The figures refer to 100 c. c. of wine.

No. 5 is a "head wine", harvested under conditions quite analogous to those of the Essence of Tokay, and made from over-ripe grapes without any

TABLE IV.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Alcohol, volume per cent . . .	14.8	13.8	13.8	12.9	6.9
Reducing sugar	0.550	2.630	7.140	14.070	39.40
Extract at 100°	2.320	5.780	10.300	19.620	—
Extract, reduced.	1.840	3.250	3.260	5.650	—
Acidity, total ($C_4H_6O_6$) . . .	0.682	0.787	0.750	0.550	0.870
Acidity, volatile ($C_2H_4O_2$) . . .	0.050	0.070	0.080	0.085	—
Glycerine	11.465	1.465	1.815	2.450	0.742
Proportion alcohol-glycerine . . .	3.080	13.270	16.440	24.020	13.26
Cream of tartar	0.118	0.115	0.140	0.135	—
Ash	0.325	0.455	0.500	0.500	0.530
Rotatory Power	—1	—1	—31	—73	—

appreciable action of *Botrytis*, that is simplyshrivelled. (1) No. 4 is a "head" wine harvested in the same year with a very pronounced development of the fungus. Nos. 2 and 3 are "middle" wines and No. 1 a "tail" wine, all of good years.

Comparing the figures of the two tables, it is seen that in the Sauternes wines with equal or higher sugar content, the alcohol content is greater than in the Tokay wines; the initial sugar content of the must must therefore have been greater also; for No. 5 this figure works out at 50 gms. per litre, whilst for Essence of Tokay it is about 370 gms., or about the same as Sauternes wines from grapes attacked by *Brotrytis*.

The fact that the fermentation goes equally far, and sometimes further, at Sauternes than at Tokay, in spite of the excess of sugar, is probably due to the warmer autumn in the Gironde.

The acidity of the two wines shows little difference, but it is generally somewhat less in the Sauternes. This is chiefly a question of the variety, though increased by the neutralizing action of the *Botrytis* rot.

In both cases the reduced extract is very high, and glycerine forms a considerable part of it. The proportion of glycerine per 100 of alcohol varies from 10 to 25 and this ratio varies directly with the quality of the wine, except in the case of exceptional wines like Essence of Tokay.

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(1) The year 1893 was very dry right on to September, and the *Botrytis* rot had not appeared by the time the grapes for this wine were gathered.

The writer explains the large amount of glycerine in Sauternes wines, firstly by the presence in the must of ferments capable of producing considerable quantities of glycerine, especially when acting in very concentrated musts; and also because, before fermentation begins, more than 1 per cent. of glycerine is found in the musts, which must have been produced by the action of *Botrytis cinerea* on the sugar of the grape.

The Tokay wines are richer in tartaric acid than the Sauternes, because the latter are more alcoholic, and *Botrytis cinerea* neutralises some of the acidity of the fruit.

A more obvious difference exists between the ash contents, those of the Sauternes being twice as great as the Tokay figures. One of the most important influences in this direction is the concentration of the juice of grapes attacked by *Botrytis*, which is greater than when they are simply shrivelled.

Again a very noticeable difference is accounted for by the use of sulphurous acid. The sulphurating of the stock is an indispensable operation in the vinification of Sauternes ; and it is owing to the presence of sulphurous acid that the wines acquire and retain their wonderful properties. The addition of sulphurous acid to the Tokay wines in sufficient quantity would cause serious inconveniences, since the development of the aroma in the wine is dependant on energetic oxidation, which would be hindered by the presence of sulphurous acid.

Of the French wines, those of Montbazillac have most resemblance in aroma, taste and colour to the wines of Tokay.

1203 – Influence of Ferments on the Variations in Dry-Extract and Glycerine in Wine.

— VENTRE, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 4, pp. 304-307. Paris, July 28, 1913.

During a course of researches carried out with the object of ascertaining the action of some elliptical ferments on the general constitution of wine, the writer was surprised to find that the ferments do not all behave in the same manner towards the extractives of grape must. His experiments lead him to the following conclusions :

1) Every ferment has a specific action on the extractives contained in the must. Some, the Champagne ferment in particular, seem to produce a sensible diminution in the dry extract, comparable with the dilution produced by certain ferments in brewing. The Médoc ferment on the contrary always gives a greater proportion of dry extract, without there remaining in consequence non-utilized reducing matter in the medium.

2) It would be interesting to know the variety of yeast which has transformed a must into wine, especially for research in adulteration by addition of alcohol ; it would suffice if this attenuation of the dry extract corresponded to a high degree of alcoholic strength for the wine to be declared as one containing added alcohol.

3) The addition of sulphurous acid to the must diminishes to a great extent the attenuating power of certain ferments, especially that of Champagne.

The writer proposed to investigate the cause of this diminution of dry extract and was led to determine the glycerine, with the following results:

a) Glycerine of organic origin is closely dependent on the ferment acting on the medium. The proportion of glycerine formed varies between 3.2 and 4.1 per cent. of the initial weight of sugar in white wines, and between 3.6 and 4.2 for red wines.

b) In media to which sulphurous acid has been added, the quantities of glycerine produced were sensibly the same in all the experiments, whichever ferment was used. The proportion varied between 3.53 and 3.7 per cent. for white wines and 3.5 and 3.68 for red wines.

c) The variations of glycerine in the same medium are, according to the author's experiments, less than those found by M. Laborde, who reports considerable variations, according to the ferments, namely 2.5 to 7.75 per cent. of the weight of transformed sugar.

BREWING AND DISTILLING

1204 – **Plum Brandy. Improvements in its Manufacture.** — ELLRODT, G. in *Zeitschrift für Spiritusindustrie*, Year XXXVI, No. 30, pp. 373-374 + 2 figs, Berlin, July 24, 1913.

Plum brandy is manufactured in the Southern States of Germany, chiefly by small farmers who frequently possess only small badly equipped distilleries.

The raw material consists of the fruit of different varieties of long plums (Zwetschen or quetsches, fruits of *Prunus domestica* and *P. œconomica*) and also the different varieties of round plums (Pflaumen). The taste of the product depends chiefly on special aromatic substances in the fruits, on the content of amygdalin and on the method of preparation. The content of sugar, the most important constituent in distillation, varies much according to the variety of fruit and the degree of maturity. According to König it varies between 6.44 and 25.62 per cent. and averages 14.71 per cent. The yield of alcohol varies considerably in consequence, and also on account of different methods of manufacture, which in some distilleries have remained unchanged for a century. The fruit is generally crushed, stones being left intact in two-thirds of the mass, crushed in the other third. In several districts however this last operation is not practised.

The crushed fruits are placed in barrels or cement troughs and allowed by means of the ferments adhering to the fruit to ferment spontaneously. Lactic and acetic acid bacilli also develop in the mass and may check the development or even destroy the natural ferments of the fruit by an excessive production of acid. The result is that the fermentation of the sugar is incomplete and that a portion of the alcohol is transformed into acetic acid if the fermented mass is kept any length of time.

Experiments have been made to accelerate the fermentation by the addition of beer yeast and to check the bacterial action or diminish its effects. All these experiments gave increased yields of alcohol, but the quality of the final product was inferior to that produced by normal fermentation. Some distillers have used compressed yeast. Better results might be obtained by the use of wine ferments in place of beer yeast either fresh or compressed.

The enormous loss of alcohol which may result from spontaneous fermentation has been ascertained by experiments made at the Distillery Institute (" Institut für Gärungsgewerbe ") at Berlin. The distiller who brought material to the Institute complaind that the yield of alcohol was exceptionally small without apparent reason.

It was found that a good deal of fallen fruit was used in the preparation of the must, with the result that a much greater number of microorganisms were introduced into the liquid, thus incresing the danger of infection.

Analysis of the must gave the following results.

TABLE I.

Density of fermented must	6.6° B.
Acidity	5.46°
„ as acetic acid	1.638 gm. in 100 c. c.
Alcohol in filtrate	5.1 per cent. by volume
Unfermented sugar	0.6 per cent.

Calculating the quantity of acids corresponding to 100 c.c. of alcohol, the exceptionally high figure of 32.11 gms. is found. Allowing for the acid already present in the sweet must, which is not inconsiderable, there remains a loss of about 20 per cent. of the total sugar due to the formation of acid.

Microscopic examination showed that the lactic and acetic acid organisms were numerous and fully active and that the ferment had been destroyed some time. To the loss of alcohol due to fementation, the loss due to distillation must probably also be added, because in some cases the apparatus used was very defective and often without an agitator. In this case, in order to prevent the fermenting mass from sticking to the walls of the still and burning, it is necessary to open the still in order to stir up the contents, which results in a considerable loss of alcohol. Also the means of determining the end of distillation is often so unsuitable that frequently alcohol remains in the residue.

Considering the high acid content of the fermented must, the writers obtained from the distiller samples of the first distillation (crude product), and of the second distillation (rectified) and tailings of the refined product (l'eau-de vie fine). The analyses are given in Table II below.

These results show that only a very small proportion of the enormous quantity of acid in the fermented must passes into the rectified product. Whilst the fermented must contains 36. 04 gms. of acid per 100 c. c. of

TABLE II.

	Eau-de-vie crude	Eau-de-vie rectified	Tailings
Results obtained:			
Specific gravity at 15° C.	0.978 226	0.927 230	0.980 778
Percentage of alcohol in volumes determined with the alcoometer . . . . %	17.7	54.36	15.34
Acids, as acetic, in 100 c. c. . . . . . . gms.	0.216	0.066	0.135
Index of total ethers	20.1	38.3	6.0
» » volatile »	18.6	38.3	6.0
» » fixed »	1.5	—	—
Hydrocyanic acid, free . . . . mgm.	traces	0.75	0.5
» » combined	1.25	2.50	—
» » total	1.25	3.25	0.5
Furfurol reaction	present	present	present
Results calculated per 100 *c.c. of absolute alcohol:*			
Acetic acid . . . . gm.	1.121	0.121	0.814
Index of total ethers	113.5	70.04	39.1
» » volatile »	105.0	70.04	39.1
» » fixed »	8.5	—	—
Hydrocyanic acid, total . . . . . . mgm.	7.06	5.97	3.26
» » combined	7.06	4.59	—
» » free	—	1.38	3.26

alcohol, the crude spirit contains 1.40 gm. and the rectified spirit 0.121 gm. Of the ether which has passed into the crude product, none of the fixed substance and only a portion of the volatile, passes into the rectified liquid. Only combined hydrocyanic acid is present in the crude spirit and a small quantity of the free acid in the rectified product, and the free acid alone in the tailings. This suggests that a hydrolysis of cyanide compounds takes place during rectification, and explains why different investigators have not been able to demonstrate the presence of free hydrocyanic acid in plum brandy, because the quantity probably depends on the degree of rectification to which the liquid has been subjected.

In conclusion, only a small part of the great quantity of acids produced by foreign organisms during fermentation finds its way into the rectified brandy. There is no definite ratio between the formation of ethers and that of acids. In avoiding the development of acids by means of pure ferments, as frequently practised of late, there is no risk of producing an inferior brandy. In fact it is probable that the use of pure ferments of superior wines (which impart to their products a fine characteristic aroma) would improve the quality of the brandy: at any rate the yield would be considerably increased.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1205 – **The First International Conference of the "Defensa Agricola" at Montevideo** (1). — Conferencia Internacional de Defensa Agricola. — *República Oriental del Uruguay, Revista del Ministerio de Industrias*, No. 1, May 1913, pp. 77-84, 1 plate. Montevideo, 1913.

On the initiative of the Government of Uruguay, the First International Conference of the "Defensa Agricola" was held at Montevideo from May 2 to 10, 1913. The Ministers of Foreign Affairs and of Industries of the Republic were Honorary Presidents (their delegate, Dr. Ed. Acevedo, being Acting President). The following States of South America were represented by their delegates and by experts: Argentina, Colombia, Chile, Paraguay, Brazil, Ecuador, Bolivia, Peru and Uruguay.

The text is given of the three Conventions drawn up by a technical commission and approved in final form by the International Conference. The first Convention consists of 15 articles, and deals chiefly with the damage caused by the locust *Schistocerca paranensis*. It arranges for an International Commission to be held before August 25 at Asunción, Paraguay; the objects of the latter are to study the centres of distribution and the concentration and diffusion zones of this locust and to propose (if it appeared necessary after a prelininary enquiry) the creation of a Central International Station with sub-stations for the purposes of *a*) determining geographically the concentration zones of *Schistocerca paranensis*; *b*) elaborating and presenting a control system suitable for the concentration zone, and (after the acceptance of this system) the directing of the necessary operations; *c*) informing all the countries interested of the movements of the swarms in order that they may take the necessary measures; *d*) drawing up and distributing frequently to the respective Governments reports on operations carried out, and upon everything which can be tried for the destruction of this injurious insect.

Matters relating to the pecuniary assistance and the reciprocal collaboration of the various contracting States were also settled, in so far as these concerned the working of the International Commission, the founding and work of the Stations, the carrying out of a common control system, the organisation of a service of telegraphic information respecting the migrations of the locusts, and the exchange of information at the close of every season.

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(1) See also No. 183, *B*. Feb. 1913. (*Ed*.).

By the provisions of the second Convention, which consists of 10 articles, the contracting States undertake to establish inspection services in their respective territories for the purpose of defending the interests of agriculture against plant pests. The latter are defined as follows: parasites, weeds, injurious birds and other animals, and all causes of pathological conditions, or of injury caused by cryptogams, insects and other animals, when they have assumed or threaten to assume a propensity for spreading likely to cause serious damage to plants.

As a result of the creation of the above-mentioned services, and for the purpose of the export, import and transit of agricultural produce, the States undertake to declare which ports are open to such importation and to fix the measures of control to which these products will be subjected; they undertake to authorize no despatch of goods to the signatory countries, unless the prescriptions of the inspection services of the said countries have been carried out, and only to accept certificates given by official agents. The States will advise one another as to the officials authorized to issue such certificates, and respecting any modifications and changes in the latter. These certificates should contain a declaration that the original plantation or nursery is free from disease, and give the name of the owner or occupier of the land, its situation, the number and species of the plants, the port of loading and unloading and the name and address of the consignee.

Further, the States are expected to communicate to one another the laws and regulations on the inspection service and any modifications of the same, likewise the existence and development of diseases, the occurrence of new diseases, and the disappearance of those already known, as well as every occasion of the refusal or destruction of imported products, giving the origin of such products, and the reasons necessitating the measures in question.

The second Convention also fixed that the second International Conference of the "Defensa Agricola" should be convoked and organised by the Argentine Government, and held at Buenos Ayres. In conclusion, it provided for the installation at Montevideo of a permanent International Bureau, ("Officina"), entrusted with the supervision of the execution of the decisions made, and to serve as an intermediary between the different bureaus or "Officinas tecnicas de Defensa Agricola" of the various adhering countries. This Bureau will consist of an agricultural engineer chosen by the Uruguay Government, and of diplomatic representatives of all the countries of South America already accredited to the Government of that Republic. The working expenses will be divided proportionally among the contracting countries. The directing Committee of the Bureau will draw up the regulations.

The third Convention announces in the text that: On the denunciation or request of any one of the Governments, the other contracting countries shall be obliged to take prohibitive measures against the importation of easily-propagated diseases which are unknown in the producing signatory countries, and this so long as they occur in the said countries, and provided there are no practical measures of efficaciously disinfecting the substances which may convey the said diseases.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

1206 – **The Cause Determining the Chlorosis of American Vines and the Method of its Control.** — ACCARDI, SALVATORE. *La clorosi delle viti americane*, 10 pp. Naples, 1913.

Chlorosis, especially in the case of American vines, may be transitory, if it depends on cultural defects, or permanent, if it is due to the composition of the soil. Temporary chlorosis may be treated by abundant manuring. Permanent chlorosis, in the opinion of the writer, should be mainly attributed to an insufficient absorption of magnesium on the part of the plants.

Magnesium is not wanting in any soil, but the carbonic acid circulating with the water in the soil dissolves with difficulty the double carbonate of magnesium and lime (dolomitic). When the magnesium occurs in this form, if any plant has not the power of directly decomposing this compound by means of the acid contained in its roots, it is deficient in the amount of magnesium necessary for the formation of its chlorophyll; hence the development of chlorosis.

The analyses made by Averna and Rossi show that Berlandieri and its hybrids contain more acid than Rupestris and Riparia, and also that the Berlandieri group has a greater power of decomposing the double carbonate of lime and magnesium than that possessed by other American vines; it is to this circumstance that it owes its chlorosis resistance (1).

Since however, according to Comes (2), nitrogenous substances in general, and manure in particular, diminish the acidity of the sap by forming a larger amount of oxydases, especially in warm soils, it follows that soils which produce permanent chlorosis must never be treated with any kind of nitrogenous manure. Phosphates (which maintain the acidity) should be used, together with such quantities of magnesium as are proved necessary by local experiments.

In conclusion, it should be noted that though ferrous sulphate is a useful remedy for temporary or transitory chlorosis, it is of little efficacy in the case of permanent chlorosis, owing to its weak action in displacing magnesium on being applied to the soil, and its slight and momentary catalytic effect when it reaches the chlorotic leaves.

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(1) See No. 495, *B.* March 1912; No. 788, *B.* July 1913. (*Ed.*).

(2) See No. 881, *B.* July 1913. (*Ed.*).

1207 - **On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by « Bramble-leaf ».** — MAMELI, EVA in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, Vol. XXII, First Half-year, Part 12, pp. 879-883. Rome, 1913.

In this preliminary note, the writer, basing her remarks on the results of studies made upon healthy and infected American and European vines, states that the presence of endocellular fibres, which is considered by Petri (1) as the "constant index" of the "bramble-leaf disease" ("roncet" "courtnoué", etc.) is not in her opinion "a symptom which is closely connected with the actual cause of the disease". Such fibres occur frequently, according to the writer, in healthy American and European vines, as well as in conifers and other plants, as has been demonstrated by Sanio, Kny, Müller, Raatz and Penzig.

In healthy vines, the writer states, the endocellular fibres occur equally in the higher and lower portions of the plant, and are found as frequently in the lower internodes as in the upper ones; while according to Petri "these anomalies occur in the upper internodes only in plants which have long been affected", and "when the fibre formation takes place at the same time at the summit and base of the plant, the injury is more rapid and more serious".

BACTERIAL AND FUNGOID DISEASES.

FUNGI

1208 - **Recent Researches on Vine Mildew *(Plasmopara viticola)*.** — Communicated by DR. GY. DE ISTVÁNFFI, *Professor at the University, Director of the Royal Hungarian Ampelological Institute, and* GY. PÁLINKÁS, *Assistant.*

1. *Delopment of mycelium and conidia.* — The germinating tube of the zoospores of *Plasmopara viticola* always penetrates the green parts of the plant through a stoma; in the cavity below the stoma the hypha swells considerably and the whole of the protoplasm collects in this swollen part: the secondary spore thus produced soon throws out a haustorium, which penetrates the nearest cell of the parenchyma, and then develops a narrow tube (3 to 5 μ), which ramifies in the intercellular spaces and produces fresh haustoria. By the third day a definitive mycelium is formed. As the zoospores send out hyphae which penetrate several stomata, each "grease spot" is caused by as many young mycelia as the zoospores which succeeded in entering. The growth of the hyphae is generally in a radial direction and obstructions such as vascular bundles are met with by a flattening out of the hypha and the development of narrow hyphal threads which pass above or below the vein and continue their way as before.

The mycelial threads may take the form of 1) cylindrical tubes, sinuous and narrow-walled; 2) vesicular tubes with irregular swellings (during damp weather: coralloid type); or 3) slightly flattened tubes often tapering and with irregular dichotomous branching. The hyphae are always aseptate and never join together. The nuclei (1.5 to 3 µ) are numerous and scattered irregularly; they form clusters at the bases of the branches and at the tips of the young hyphae. Generally they are round, but when developed rapidly they become fusiform in shape.

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(1) See No. 968, *B.* June 1912; No. 1349, *B.* Sept. 1912; and No. 67, *B.* Jan. 1913 [*Ed.*].

The haustoria occur irregularly and are sometimes united in groups. Haustoria with long pedicels were previously unknown. They also possess a nucleus, which ultimately divides.

After the mycelium has developed, it sends out smaller filaments into the stomatic chamber, which form conical masses and raise the surrounding tissue. Under favourable conditions (heat and sufficient moisture) thin filaments from these hyphal masses pass out through the ostiole of the stoma, become swollen and present the appearance of young conidiophores, either, 1) isolated, 2) joined together in a strawberry-like mass, or 3) with the extremities forming pear-shaped swellings which give rise to conidiophores. When these filaments begin to extrude, the nuclei advance in quantities, and the dense protoplasm containing them passes into the branches.

After a short period of growth a slight swelling appears just below the tip, and into it the protoplasm condenses. At the time of migration the nuclei are in a rapid state of division and are fusiform, elongated or horse-shoe shaped. In the course of the development of these swollen parts (which represent the stems of young conidiophores), appear first primary and later secondary branches which terminate in trifid sterigmata. (At the base of these branches we have observed finger-like bodies, hitherto unknown, which are probably rudimentary sterigmata). Fructification begins immediately, the first conidia forming after 4 to 6 hours on the sterigmata of the lower branches. Under favourable conditions fructification is completed within 10 or 12 hours.

We have observed by staining that the first protoplasm to pass from the sterigma to the young conidium is not very dense; it is followed by a denser part, generally containing the nucleus. This nucleus then divides several times. In the development of the conidia there are three distinct periods: 1) the conidium has reached its full size and the nuclei begin to divide, though the conidium is not ripe; 2) after 3 or 4 hours from the appearance of the young conidia karyokinesis ceases; the conidia are half ripe and if placed in water cannot produce zoospores for a long time; 3) the protoplasm takes the form of a network, the nuclei take up definite positions, and the conidia become fully matured. These facts account for the variation in virulence and the numerous differences recorded by various observers concerning the liberation of the zoospores.

The practical importance of this is that the conidia only become virulent after a period of about 24 hours. Thus it follows that the conidia produced in the morning after evening rain, cannot produce infection unless rain also falls during the afternoon or night following. Thus fresh infection may be avoided by spraying immediately. With a mist the conidia may begin to germinate even before dropping from the conidiophores, which explains why mists are so harmful.

We have already (1911) described the cover or lid of the conidium. During germination this lid is forced up by the zoospores, which then effect their escape.

At a temperature of 6° to 8°C. they maintain their vitality for 3 to 8 weeks, but do not survive drought for more than 5 days; dry weather following abundant rain is particularly destructive of thin-walled conidia.

In studying the effect of copper salts, we find, 1) that a solution of 1 in 1 600 000 of copper sulphate hinders germination, but that the conidia can germinate in a solution three times as concentrated as that indicated by Millardet and Gayon ; 2) that in the most dilute solution the formation of zoospores is considerably retarded (as much as 12 hours).

In artificial media the development of zoospores ceases at the time of liberation from the conidia, which has been observed to take place after 2 to 6 hours in the different solutions employed (bouillon, sweet wort, liquid manure, hay extract, etc.), diluted from 5 to 10 times.

2. *The period of incubation.* — This is defined as the period between the attack of the zoospores and the appearance of the first symptons of the disease on the plant (grease-spots on the leaves; yellowish-brown spots on the bunches, tendrils, etc.).

The length of the incubation period depends on the temperature and humidity of the surroundings ; for leaves it diminishes as spring advances ; from the beginning to the middle of May it is 15 to 18 days ; at the end of May, 12 to 15 days ; at the beginning of June, 11 to 13 days ; at the middle of June, 9 to 11 days ; at the end of June, 6 to 7 days; and in July and August 5 to 6 days, provided the weather is normal.

On the bunches the duration of incubation varies as follows : from the end of May to the beginning of June, 12 to 14 days ; at mid June, 9 to 11 days ; at the end of June, 10 to 12 days ; in July 12 to 14 days. It is longer by 3 to 5 days if the infection takes place on the stalks of the grapes or on the main stalk of the bunch, as in this case the mycelium has to traverse the intermediate tissues, so that in July the period of incubation may be from 17 to 19 days.

During warm weather the incubation period may be so much shortened, after abundant rain, that the grease-spots do not show before the mildew breaks out. In this case the period of incubation on the leaves is 10 to 12 days at the end of May, 8 to 10 days at the beginning of June, 6 to 8 days from mid June to the end of the month and 4 or 5 days in July and August ; on the branches it is 9 to 11 days in the first half of June, 7 to 9 in the second half and 8 to 10 days in July. In such cases the vine growers believe that infection takes place during the rain on the day previous to the appearance of the mildew. This idea is erroneous, as infection always takes place 4 to 6 days sooner, and rain immediately before the appearance of the symptoms of disease has only the effect of reducing the period of incubation.

3. *Grease spots.* — These are the yellow or pale green transparent spots which appear on the green parts of the diseased plant immediately after the development of the mycelium, owing to destruction of the chloroplasts. On the fruits and old shoots the point of infection assumes a greyish or

brownish tint. The true "grease spot" appears along the edges and veins of the leaf.

The shape and size of the spots depends generally on the weather, the variety and the growth of the leaves; in cold or wet weather the spots are large and round; with drier weather they are smaller and more angular; on susceptible vines they are larger than on resistant varieties. After the appearance of the spots the first rain starts the development of conidiophores, which form the mildewed appearance on the diseased patches. The formation of the mildew is dependent upon the humidity; in dry weather it takes from 4 or 5 days to 12 or 20 for its appearance, and if there is no dew at night it may not appear at all.

4. *Infection experiments.* — All the young and green parts of the vine (including leaves half an inch in length) can be infected in the laboratory as well as in the open air. The success of the infection depends upon the state of the plant, the virulence of the conidia and the local conditions. Infection can be produced on the surface of the leaf, but only along the larger veins and indentations. The susceptibility of the plant depends upon the supply of water in the organ, the vapour tension in the stomatic chambers and intercellular cavities generally, the turgescence of the cells, and to some extent on the chemical composition of the cell sap.

In June 1911 we carried out artificial infection experiments on the bunches in the open air and described them in August of the same year. We found that infection rarely takes place on fruits the size of a pea, because of a suppression of some of the stomata.

By means of conidia preserved for 3 weeks in an ice-room (at 6° to 8° C.) we have been able to cultivate the fungus throughout the winter on forced branches; by retarding the appearance of the mildew we have succeeded in preserving the mycelium in the "grease spots" in a latent condition during 7 or 8 weeks. Under suitable conditions of warmth and humidity the incubation period is the same under glass as in the open.

5. *Bearing of the incubation period on practice.* — Attacks of mildew take place after rain, thick fog or heavy persistent dew; the appearance of the mildew also occurs after rain; consequently the development normally depends on two rainfalls. It is therefore necessary to apply the sulphate at least after the appearance of the grease spots.

To detect the presence of the grease spots, before their appearance in the vineyard, the suspected leaves are first sprinked with water and then covered up and kept in a warm dark place. The bunches are wrapped up in moist filter paper and placed in a warm damp chamber. After a few days the mildew breaks out on the suspected material and the disease is easily recognised.

6. *Use of the incubation calendar and trials.* — The grower should note any appreciable rainfall (say half an inch) between the end of April and the beginning of May and allow for the incubation period 15 to 18 days. This gives the date of appearance of the grease spots due to infection from winter spores. He must also notice if the temperature falls below 10°C. (50°F.), as the disease cannot develop below this temperature. The artificial for-

cing should be made 5 or 6 days and again 2 or 3 days before the expiration of the date of incubation (with both leaves and fruits).

In calculating the date of incubation, only the rainfall of two or three days duration may be taken together and the period must be reckoned from the first day of rain. From mid-June onwards even small showers must be reckoned. Heavy showers are the most dangerous, and it is then that the bunches require attention.

1209 – **Conditions Favourable to the Development of Mildew.** — MENGEL, O. Evolution du Mildew suivant les Conditions de Milieu. — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, Second Half-Year, Vol. 157, No. 4 (July 28, 1913), pp. 292-294. Paris, 1913.

From observations made in France it appears that infection by mildew is due to *a*) general causes; *b*) secondary causes depending on the nature and vitality of the vine, and on its adaptation to local conditions, such as the composition and exposure of the soil; *c*) accidental causes (such as manure, tillage, drainage of the soil, etc.).

As the general causes are bound up with atmospheric variations, meteorological observations are required to provide warnings and timely information. Preventive measures can always be successful in normal years when periods of infection do not overlap each other, as happened this year at Roussillon (Pyrénées Orientales).

For secondary and accidental causes, it is necessary to make researches into the variations in the development of the disease. For example, the variety Grand-noir will remain free from disease though surrounded by the Carignan variety badly infected; and the Carignan of Salanque (1), growing in soil of normal humidity, will be protected from infection by treatment with copper sulphate, owing to its adaptation to the local conditions, whilst the upland variety of Carignan, growing in soil accidentally inundated, would require double the treatment.

Since the spores of mildew, like those of all Phycomycetes, are disseminated by the least breath of wind, one would expect to find them in sufficient numbers to cause infection in any position. The writer has sufficient evidence for believing that a district previously infected with the disease is not more liable to infection than any other, provided that the local conditions previously favourable to the development of the disease no longer exist. Nor does he think that a hill-side situation is more liable to infection when it faces winds coming from previously infected areas. Further, in Roussillon this year the prevailing winds during the infection period came from the sea and the most badly mildewed districts were precisely those which were exposed to these sea breezes almost free from contamination with spores; this is accounted for by the writer as being due to the warm damp breezes accelerating the germination of the spores; no doubt a more rigorous treatment with the fungicide would have kept it in check.

The vine-grower should therefore be acquainted with the modes of action of these secondary and accidental causes and be able to act accordingly. It is well known that tillage during the period of infection is disastrous; consequently this operation must be postponed, or if urgently needed, a dressing of sulphate of copper must follow immediately behind the plough. In manured vineyards it will be advisable to double the treatment or to partially defoliate the plants to let more air into the bunches. In this way the accidental causes are prevented from creating local conditions similar to those of the general causes.

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(1) Coast plain of the Pyrénées Orientales. (*Ed.*).

MEANS OF PREVENTION AND CONTROL

1210 – Comparative Spraying Experiments with some Commercial Fungicides.

— BRETSCHNEIDER, ARTUR. Vergleichende Versuche mit einigen Spritzmitteln gegen die Blattfallkrankheit (*Peronospora viticola* De Bary) des Weinstockes. — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 6, pp. 718-725. Vienna, 1913.

In 1912 comparative experiments were carried out in various parts of Austria with Bordeaux mixture (1-2 per cent.) and the following commercial fungicides: "Floria-Kuperseifenbrühe" (3 per cent.), "Forhin" (1-2 per cent.; but the formula does not correspond with that given by the makers), and "Perocid" (1-2 per cent.), chiefly against attacks of vine mildew (*Plasmopara viticola*), but also (at Znaim) against *Pseudoperonospora cubensis* on Cucurbitaceae and certain fungi on fruit trees (*Fusicladium*, *Monilia*, etc.).

The wetting power of all these preparations was found to be very good. The writer does not consider the visibility of the spray on the leaves very important; for this point Bordeaux mixture comes first, followed in order of merit by "Floria-Kupferseifenbrühe", "Perocid", and "Forhin". For rapidity of preparation, the order is: "Floria-Kupferseifenbrühe", "Forhin", "Perocid". All the solutions were neutral and harmless to plants, with the exception of "Forhin" on one occasion, and they had advantages over Bordeaux mixture in being ready for immediate use and not requiring testing for neutrality. They were also generally in a very fine state of division. Bordeaux mixture at 2 per cent. alone gave thoroughly satisfactory results in 1912 as a fungicide. With all the other preparations the mildew developed more or less vigorously. Arranged in order of merit with regard to their fungicidal properties they are as follows: Bordeaux mixture at 2 per cent., then at some distance Bordeaux at 1 per cent., "Forhin", "Floria-Kupferseifenbrühe" and "Perocid". The inferiority of the last-named mixture is due to the low concentration of the liquid.

"Floria-Kupferseifenbrühe" and "Forhin" are the most expensive and "Perocid" the most economical in price.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1211 – Some Interesting Cryptogamic Diseases which Appeared in Hungary in 1912.

— PATER, B. Mykologisches aus Ungarn, - *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 5, pp. 260-262. Stuttgart, August 20, 1913.

The year 1912 was the most favourable for the development of cryptogamic diseases which can be remembered in Hungary. The writer, who carried out some researches at Klausenburg (Kolozsvár), records from this place eight species of fungi, all interesting from different points of view.

1) *Puccinia graminis*; this appeared for the first time on rye, after the writer had sought for it in vain for about 20 years; the harm caused was, however, not great.

2) *Puccinia Malvacearum*, also observed for the first time, on marsh mallow (*Althea officinalis*). It attacked, but only slightly, plants of one year of age; those from 4 to 5 years old were immune.

3) *Epichloe typhina*, already recorded before 1912 as occurring on *Agropyrum repens*; this fact is doubly interesting, because on the one hand the fungus had not yet been registered in the literature on the subject, and on the other, the parasite proved useful in arresting the development of the weed, preventing it flowering and fruiting.

4) *Puccinia bullata*, very common on cultivated specimens of *Conium maculatum* as in 1911; the uredospores appeared in May, and the teleutospores during the second half of August, not only on the stems and leaves, but also on the inflorescences.

5) *Plasmopora nivea* on the same plants of *Conium*; wild individuals of this Umbellifer growing close to the cultivated specimens remained entirely immune, and as the latter were growing in rich well-manured soil, it appears that their excessive vigour rendered them more susceptible to the attacks of the disease.

6) *Phoma foeniculina*, very common on fennel, as in 1911; the infected plants bore smaller and fewer seeds than the healthy ones.

7) *Puccinia Menthae* on *Mentha canadensis* var. *piperascens*.

8) *Oidium quercinum* on oaks; these have been attacked by the fungus since 1910; the old trees were immune.

1212 – ***Sclerotium Oryzae* on Rice in India.** — SHAW, F. J. F. A Sclerotial Disease of Rice. — *Memoirs of the Department of Agriculture in India*, Vol. VI, No. 2, pp. 11-23, 1 fig., plates I-III. Calcutta, July 1913.

Sclerotium Oryzae was first described by Cattaneo in 1879 as damaging rice in Novara and Lombardy. It was discovered in Japan in 1910 by Miyake and during the past year it has been found in various parts of India.

Infected plants can be distinguished from their healthy neighbours by abnormally prominent tillering, a fact that appears to have been overlooked by previous workers. Later the infected culm gradually turns yellow and dies and the ears are poorly developed and empty. Within the hollow stem at the base a dark greyish web of hyphae is visible with small black sclerotia dotted over the surface.

The writer describes his preparations of the fungus in pure culture and its appearance on various media. Inoculations of the pure cultures on sterile seedlings gave positive results.

The author concludes by pointing out the differences between his observations and those of previous workers on allied species and draws attention to the interesting changes in colour and form of the hyphae grown in the different media.

Remedial measures against such a parasite as this do not appear to be practicable, and the writer suggests the breeding of resistant varieties as the only method of dealing with the disease.

1213 - ***Lasiodiplodia Theobromae*** **parasitic on Cacao in Dahomey.** — BERTHAULT, PIERRE. Sur une maladie du Cacaoyer dans l'Ouest Africain. — *L'Agronomie Coloniale, Bulletin mensuel du Jardin Colonial, Nouvelle Série,* Year 1, No. 1 pp. 8-14, figs. 1-3. Paris, July 30, 1913.

The cacao plantations in Dahomey have been ruined by a disease known locally as "sun-stroke" or "apoplexy", which attacks the root, trunk and branches and destroys in a few days otherwise healthy and productive trees. As a result of his examination of the disease the writer concludes that it is due to a parasite, *Lasiodoplodia Theobromae* (Pat.) Griffon et Maubl. (1).

He suggests experiments to test the efficacy of copper mixtures and lime-sulphur, and disinfection of the soil by carbon disulphide injections. Further studies on this subject are required.

1214 - **"Soft Rot" of Bulbs of *Ixia maculata* and *Gladiolus Colvillii* produced by *Bacillus Ixiae* n. sp. and *Pseudomonas Gladioli* n. sp.** — SEVERINI, G. Una bacteriosi dell'*Ixia maculata* e del *Gladiolus Colvillii*. — *Annali di Botanica,* Vol. XI, Part 3, pp. 412-422, plate VIII. Rome, 1913.

In April 1912, the writer observed a soft rot on bulbs of *Ixia maculata* and *Gladiolus Colvillii* resembling a bacterial disease. All the plants (from bulbs obtained from Holland), though grown in quite separate frames, showed signs of the disease simultaneously, at the time of appearance of the first blooms.

The symptoms of attack begin with a yellowing of the tips of the leaves extending longitudinally to the base, and finally the whole leaf turns yellow. Livid purple spots then appear, quite distinct at first, but later changing into a greyish black mass. The whole shoot is easily detached from the bulb, and may fall to the ground of itself. On superficial examination, the bulb appears normal, but within the outer sheath it is covered with yellow or reddish spots and is found to be flaccid and full of a soft granular mass. The disease attacks young bulbs equally with the old ones.

The writer has obtained pure cultures of the organisms present in the diseased tissue, and out of five bacteria which he isolated he found that three were capable of producing the disease by artificial infection. One of these organisms occurred on *Gladiolus* and the two others proved to be one species capable of producing the disease in either *Gladiolus* or *Ixia*. The organism from *Gladiolus* he named *Pseudomonas Gladioli* and the one common to both *Bacillus Ixiae*.

The above organisms are capable of producing "soft rot" of the bulbs and leaf sheaths. They are confined to the intercellular spaces of the parenchyma, where, by dissolving the median lamellae they produce a complete separation of the cells. They do not alter the cellulose walls or the starch grains, but the protoplasm is soon poisoned. *Bacillus Ixiae* appears to attack the pectic matter of the median lamellae more vigorously, whilst *Pseudomonas Gladioli* exerts a greater toxicity towards the protoplasm.

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(1) See also No 316, *B.* Jan. 1911, and No. 616, *B.* Feb. 1911. (*Ed.*).

The writer also found that both organisms can produce the disease in other plants, but that the power of adaptation is less with *Bacillus Ixiae.*

Infection, under natural conditions, probably takes place through the base of the bulbs, where the micro-organisms can readily gain entrance. The conditions necessary for the progress of the disease are a temperature of 25° to 30°C. and great humidity.

As preventive measures the winter recommends: *a*) using only bulbs from uninfected districts and storing them in a dry airy place; *b*) disinfection of the bulbs by plunging for 15 minutes in warm water at a temperature of 50° to 55°C. (122° to 130°F.); this does not hurt them, while the organisms are killed at 47°C. (117°F.); *c*) mould and pots that have been near infected plants should be discarded and the frame disinfected with formol or milk of lime; *d*) the plants must have a free circulation of fresh air, plenty of light, and not too much moisture.

1215 - **Dik-voet, Club-root, or Finger-and-toe** ***(Plasmodiophora Brassicae, Woronin)*** **in South Africa.** — POLE EVANS, I. B. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 93-97, plates V-VII. Pretoria, July 1913.

This is the first report of the occurrence of this disease in South Africa, though it has undoubtedly existed durng the past 10 or 15 years. The extent of the present outbreak in the Cape Province emphasises the importance of greater vigilance on the part of the farmers and of a more ready co-operation between the cultivator and scientific expert in the control of plant diseases.

Up to the present it has not been observed as occurring on turnips in South Africa, though this is the crop most frequently attacked in England. This particular outbreak appears to be nearly confined to cabbages and cauliflowers.

The writer describes the characters of the disease and the usual preventive measures.

1216 - **"Ferrugem da pimenteira"** ***(Puccinia Capsici*** **n. sp.) on Various Species of Capsicum in the State of Sao Paulo, Brazil.** — AVERNA-SACCA, ROSARIO. — Ferrugem da pimenteira, Puccinia Capsici n. esp. — *O Fazendeiro*, Year VI, No. VII, pp. 258-259, 2 figs. S. Paulo, July 1913.

Puccinia Capsici n. sp., which appeared for the first time in 1909, is now a serious pest of capsicums in various parts of the State of Sao Paulo on all types of soil; plants in damp and shady situations are, however, most susceptible to the disease. Up to the present it has been recorded on *C. odoriferum* (pimenta da China), *C. frutescens* (pimenta cumarim), *C. pendulum* (pimenta malagueta), and *C. microcarpum* (pimenta cumarim miuda), but not yet on *C. grossum* (pimentões); it is probable, however, that the latter is equally susceptible, because hardier and consequently more resistant varieties like those above mentioned are not immune to the disease.

This fungus attacks all parts of the plant; on the stalks and branches of several years' growth it produces fruiting pustules, resulting in lesions and hypertrophy of the parts affected. The terminal buds are attacked most severely and become deformed and shrivelled. The leaves become covered with distinct spots, corresponding to fruiting bodies on the under side; they soon curl up and eventually wither. The flowers are also attacked, particularly on the peduncle and calyx; attacks on the peduncles occasion loss of fruit.

1217 – **A Die-back Disease of Douglas Fir produced by a Variety of *Sphaeropsis Ellisii*.** — Petri, L. in *Annales Mycologici*, Vol. XI, No. 3, pp. 278-230, figs. 1-3. Berlin, 1913.

In the spring of 1912, a large number of Douglas firs, which had been planted 5 to 7 years ago in fresh sandy soil protected by a covert of Scots pine at Grezzano nel Mugello (Tuscany), at 1000 ft. above sea-level, showed a drying up of the tips of the branches. This drying up of the branches ended abruptly a short distance from the summit of the tree and at the point of separation between the dead twigs and the part still green a mycelium could be detected, which spread into the cortical tissues. When kept in a moist chamber, pycnidia developed and the fungus was identified as a variety of *Sphaeropsis Ellisii* Sacc., a species of fungus having many distinct forms identified by the host plant rather than by morphological characters.

The variety on *Pseudotsuga* differs slightly from the known varieties of *Sph. Ellisii* in the dimensions of its spores, and approaches nearest to the variety *Abietis*.

The writer has not yet obtained the germination of the spores in nutritive media.

The chief cause of the outbreak appears to be attributable to the position of the trees attacked; in spite of the south aspect, they have not sufficient light, and grow in an excessively moist atmosphere. At a distance of 50 yards, on the same soil, there are thousands of Douglas firs of the same age, but not shadowed by any other trees, and all are perfectly healthy.

Although direct observation has not yet been made, it is possible that the infection of the Douglas firs took place with spores of *Sphaeropsis* from the branches and cones of the *Pinus sylvestris*, and that the fungus developed on the young trees owing to the special conditions of humidity and temperature.

Successful experiments to prevent infection have been carried out by spraying with a 1 per cent. mixture of lime and copper sulphate.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1218 – ***Avena fatua* and other Species of *Avena*, with their Hybrids, as Weeds of Cereal Crops in France in 1913.** — Rabaté, E. La folle avoine. — *Le Progrès Agricole et Viticole*, Year 33, No. 32, pp. 116-180, figs 1-5. Montpellier, August 10, 1913.

Avena fatua (the wild oat), with other wild annual species of *Avena* (*A. barbata*, *A. strigosa*, *A. sterilis*, *A. Ludoviciana*) and hybrids between these and *A. sativa* (the cultivated oat) — all known in France as "folle avoine" and common weeds of grain crops in the south-west and south of the country — has been very prevalent in the crops this season, after a mild winter and rainy spring.

The losses to farmers have been very considerable. In some fields the grain had to be cut green in early June to prevent the wild oat seeds being shed.

From his own observations on some fifty farms, and from reports received, the writer considers that there are good botanical characters for distinguishing the seeds of *A. sativa* from those of the weed species, but the matter becomes hopeless for certain hybrids which are very close to the cultivated oats.

Severe winters destroy the weed species in large quantities.

The deep ploughings of 1912 favoured the great invasion of 1913. After such deep work it is well to take either a spring root crop or a market-garden crop before cereals, as such a crop allows the wild oats to come up in abundance, and they soon get destroyed by the repeated hoeings.

Ploughing the stubble after a very foul crop of wheat only induces the germination of quite a few seeds of wild oats; the majority remain dormant in the soil for many years. Summer ploughing on over-dry land favours the development of wild oats in the grain crop following. On badly infested land oats, wheat and red clover ("trèfle violet de Hollande") must not be grown for several years; on such land smothering crops, such as rye, lucerne, temporary leys, rape and mustard, should alternate with well tilled root crops and green crops cut before the wild oats flower. On such land wheat cannot do better than after two cleaning crops in succession, either a green crop and a root crop, or two root crops.

Commercial oats containing grains of hybrids of weed species with *A. sativa* should be crushed before feeding to stock.

For control measures the writer advises: hand-hoeing in February or March; horse-hoeing of cereals in drills in February, followed by spraying with 10 per cent. sulphuric acid; pulling up of tufts in April and May; pulling of the ears in early June; cutting green followed by ploughing; destruction of chaff which may contain wild oats; and lastly firing the stubble.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1219 – ***Leucopis nigricornis*, a Natural Enemy of *Pulvinaria camelicola*.** — MALENOTTI, ETTORE. Sopra un nemico naturale della "Pulvinaria camelicola" Sign. — "*Redia*", Vol. IX, Part I, pp. 113-155. Florence, August 28, 1913.

Some specimens of *Pulvinaria camelicola* collected at Ascoli Piceno (Italy) on the leaves of orange trees and forwarded to the Royal Station of Agricultural Entomology at Florence, were found to have deformed ovisacs, and the writer discovered this to be due to the presence of dipterous larvae feeding on the eggs. The writer reared these parasites early in June and identified the fly as being *Leucopis nigricornis*, a species already recorded as a parasite of insects in Hawaii and the United States, but which is not very common and of whose habits little is known. It appeared that, in Italy at least, *Leucopis* had not before been recorded as a parasite of *Pulvinaria camelicola.*

INSECTS INJURIOUS TO VARIOUS CROPS

1220 - ***Aelia acuminata*, a Hemipterous Pest of Cereals in Algeria.** — VERMEIL, P. Un ennemi de plus des céréales. — *Revue Agricole et Viticole de l'Africque du Nord (Algérie-Tunisie-Maroc)*, Vol. II, No. 71, pp. 644-646. Algiers, July 19, 1913.

During May and June, the grain crops (wheat and barley) in several districts of Algeria were reported to be attacked by an insect which pierced the soft unripe grains and caused them to dry and shrivel up in the ear. The writer identified the insect as *Aelia acuminata* (Hemiptera), which occurs normally on uncultivated land, but which in certain seasons multiplies very rapidly and seeks food in neighbouring cornfields.

The writer recommends sowing the corn in separate strips so that a workman can pass between and collect the insects in a butterfly net. In this way many insect pests can be collected and destroyed by burning. Two gatherings at intervals of 8 or 10 days are generally sufficient to remove the bulk of the insects. The cost of collecting and burning the insects amounts to only about 4*d* an acre.

1221 - ***Heterodera radicicola* on the Roots of *Scirpus sylvaticus*, in Silesia.** — OBERSTEIN, O. Eine neue Älchengalle an den Wurzeln der Waldsimse (Scirpus silvaticus L.). — *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 5, pp. 262-264, figs. 1-2. Stuttgart, August 20, 1913.

In the spring of this year, Dr. A. Lingelsheim found nodular and fusiform swellings on the roots (chiefly the lateral ones) of *Scirpus sylvaticus* growing in the Botanical Gardens at Breslau. It was found that these swellings were due to the presence of *Heterodera radicicola* Greeff. This discovery is interesting because gall-like formations have not before been recorded on the genus *Scirpus*, and also because *S. sylvaticus* is a new plant host of this widely spread nematode.

1222 - **The Hop Aphis in the Pacific Region.** — PARKER, W^m B. — *United States Department of Agriculture, Bureau of Entomology, Bulletin* No. 111, pp. 43 + figs. + 10 plates. Washington, May 1913.

The hop aphis (*Phorodon humuli*), known as a pest in Europe long before hop growing became an industry in America, is now a troublesome pest in most of the hop-growing sections of British Columbia, Washington, Oregon and California.

The writer gives the results of his observations and experiments made at Sacramento and Santa Rosa (California). From a series of observations on the biology of the insect and its relations to its host-plants (hop, plum, cherry, peach, apple), he describes the life history as follows.

Two generations are produced on the hibernating host plant, the second of which is winged; five or six generations occur on the hop; some of the fifth generation are winged and give rise to the hibernating generation, whilst others remain wingless and give rise to a sixth generation of winged

Experiment	Materials used	Pressure	Percentage killed.	Cost per 100 gals.
		lbs.		
1	Nicotine sulphate 1 in 3 000	80–100	99.9	$0.416
2	Nicotine sulphate 1 in 3 000; with whale-oil soap, 4 in 100	80–100	99,2	0.80
3	Nicotine sulphate 1 in 3 000; with cresol soap, 1 in 300	80–100	95	0.83
4	Tobacco waste, 25 lbs. to 100 gallons water	100	100	0.18
5	Quassia 9 lbs., whale-oil soap 6 lbs., water 100 gallons	—	—	0.74

males on the hop; these winged males of the sixth generation follow the winged females of the fifth generation, which produce eggs and give rise to the first generation the following spring. The eggs are laid on leaf buds or leaf scars.

The aphides live chiefly on the under side of the leaves and are only to be found on the upper surface during a bad attack; later they migrate to the hop cones. The spread of the attack is facilitated by ants (*Formica subsericea* Say), which cultivate them for the honey-dew and carry them to the young shoots for fresh feeding grounds.

Damage to the hop plants is brought about in two ways: 1) by sucking the juices of the plant, and 2) by the growth of a black smut (*Cladosporium* sp.) in the sugary secretion, which deteriorates the value of the harvest, often rendering it worthless.

Amongst the natural enemies of the hop aphis are the following: *Hippodamia convergens* Guér., *Coccinella californica* Mannh., *C. abdominalis* Say, *Chilocorus orbus* Cas., *Chrysopa californica* Coq., *Syrphus opinator* O. S., *S. americanus* Wied., *Triphleps insidiosus* Say, *Adalia bipunctata* L., *Stethorus punctum* Lec., *Camptobrochis nebulosus* Uhl., *Anthocoris* sp. In spite of these enemies the spread of hop aphis has never been adequately checked and contact sprays are generally adopted, especially decoctions of tobacco or quassia and whale-oil soap.

Spraying should take place in the springtime as soon as the aphides appear on the plum or other fruit tree, then again in the autumn to reduce the attack on the hops. Twice to four times is necessary in the autumn to keep down the numbers of the aphides, and each time the greatest care must be taken to reach both sides of the leaves. Very careful spraying alone has been known to save the crop from serious attacks.

Details are given of several experiments made with different insecticides and of the technique of spraying. Flour paste is specially recommended in place of soap as being cheaper and quite inoffensive. It is made by mixing a cheap flour with cold water until a smooth thin butter is obtained. This is diluted until it contains 1lb. of flour to each gallon of water and is then cooked to a paste, sufficient water being added to make up for evaporation; when mixed with the insecticide the flour paste has a tendency to settle, so that constant agitation is necessary.

The table on the preceding page gives the most important mixtures for use with a compressed air sprayer.

From 300 to 500 gallons per acre are required and one machine will spray from 2 to 3 acres per day. The total cost of spraying 500 gals. per day of the nicotine sulphate flour-paste mixture amounts to $6.79 per acre, whilst the quassia and whale-oil soap mixture amounts to $7.25 per acre. Stripping the vines before spraying will cost from $1.80 to $2 per acre.

A bibliography of 34 works is appended.

1223 – ***Aphrophora spumaria* on Roses and Pinks.** — MOLINAS, E. L'*Aphrophora spumaria* sur les œillets d'Antibes. — *Journal d'Agriculture pratique*, 1913, Vol. II, No 31, p. 155. Paris, July 31, 1913.

Roses and pinks have been attacked this year at Antibes by the larvae of *Aphrophora spumaria* (Hemiptera), which reduced the foliage and caused the young shoots to turn yellow. As a rule the damage due to this insect is slight because the larvae appear only in small numbers and towards the end of the season. The ravages of this pest are kept in check by hand picking and dusting the plants with quick lime.

1224 – **Painted Lady Caterpillars damaging Artichokes in France.** — TSCHAËN, E. Un parasite de l'artichaut. — *Le Progrès Agricole et Viticole (Edition de l'Est-Centre)*, Year 34, No. 29, pp. 88-89, figs. 1-2. Montpellier, July 20, 1913.

The caterpillars of the Painted Lady (*Pyrameis cardui*), which are generally to be found on thistles and mallow in France, occasionally appear in artichoke beds, but its numbers are generally too small for it to be considered as a serious pest.

However, in the spring of 1913, large artichoke beds in the neighbourhood of Hyères were entirely destroyed in a few days by these caterpillars, which then invaded neighbouring plants, including a bed of French beans. Several insecticides were tried, but with little success. The writer suggests that the egg-laying should be carefully watched towards the end of April, and a suitable insecticide used to drive away the butterflies.

1225 – ***Nysius senecionis* Attacking Recently Planted Vines** (1). — PICARD, F. in *Le Progres Agricole et Viticole*, Year 30, No. 30, p. 101. Montpellier, July 27, 1913.

This noxious insect (Hemiptera) is very abundant this year on young grafts in many localities in France. The writer recommends the treatment previously mentioned as being the most effective.

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(1) See No. 1484, *B.* Oct. 1912. (*Ed.*).

1226 - **Some Animal Parasites on *Prunus* in Provence.** — COTTE, J. in *Journal d'Agriculture pratique*, Vol. II, No. 34, pp. 243-244. Paris, August 21, 1913.

The writer has been studying the animal parasites deforming plants in Provence during the last two years and describes those which he has observed recently on *Prunus domestica* and *P. spinosa.*

Amongst parasites attacking the leaves (already recorded in other European countries) he mentions: a) *Eriophyes similis*, not widely spread and causing little damage; treatment consists of severe pruning and removal of the leaves attacked later by the parasite: it is also kept in check by numerous enemies. b) *Aphis cerasi*, the commonest aphis on plums in Provence. c) *Myzus pruni-mahaleb*, occurs everywhere. d) *Hyalopterus pruni.* e) *Perrisia tortrix*, not frequent.

As a parasite on buds the writer cites another Cecidomyiid, *Asphondylia prunorum*, which, though long known, has been little studied. It rarely occurs on plums, but is common on blackthorn, and the writer recommends the destruction of all blackthorn bushes infested with this pest in the neighboorhod of plum orchards, or at any rate their treatment with a suitable insecticide.

1227 - ***Melitomma insulare* and *Rhina nigra*, Beetles Injurious to Coconuts in Madagascar.** — VUILLET, A. Deux ennemis du Cocotier de la région Malgache. — *L'Agronomie Coloniale*, Year 1, No. 2. pp. 33-37, 1 plate. Paris, August 31, 1913.

The writer describes the life history of *Melitomma insulare* Fairm., its habits and means of combatting it. (1). It occurs in the Seychelles and in the island of Berafia (north-west of Madagascar), where it causes serious damage to coconut plantations; it is probably distributed throughout the Madagascar region.

Rhina nigra Drury also occurs in Madagascar, as well as Berafia, where it has given much trouble. This beetle has been observed to attack trees regularly at a height of 5 feet, though they were already damaged at their base by *Melitomma* beetles. These observations do not agree with those of F. W. Urich concerning *Rhina barbirostris* (2). The eggs are laid in a small cavity of the bark made by the female and the larvae very soon penetrate into the hardest portions of the wood where they bore numerous galleries.

Preventive measures are adopted against this parasite by covering all wounds in the bark with coal-tar, and using a mixture of thick lime wash and lead arsenate (1 lb. of lead arsenate in 10 gals. lime wash) to destroy the eggs laid on the tree trunks. At Berafia the eggs are destroyed by scraping the bark and the application of coal-tar. Trapping the insects by placing sections of decaying stumps in the plantations to attract the fertile females, and destruction of the larvae by boiling water, might be tried with advantage.

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(1) See No. 2005, *B.* June 1911. (*Ed.*).

(2) See No. 1698, *B.* Dec. 1912.

1228 – Insect Injourious to Papaw Apples: *Dichocrocis punctiferalis.* — JARVIS., E. in *The Queensland Agricultural Journal*, Vol. XXXI, Part I, pp. 33-35. Brisbane, July 1913.

A disease of papaya trees was reported from Cleveland in May, and was found to be due to a well-known insect pest, *Dichocrocis punctiferalis.* Though primarily a maize pest, this insect appears to be extending its ravages to fruit trees, reports having already been received of its damaging custard apples, oranges, peaches, loquats, cotton and other fruits and seeds. The infested trees had their top leaves drooping or dead, their main stems defoliated, with small discoloured fruits hanging from the blackened crowns.

The full-grown moth measures about an inch across the expanded wings, which are pale orange-yellow with numerous dots. It appears only at night and lays its eggs on the base of the leaf stalk or occasionally on the fruits. The larvae penetrate the stalk and bore their way to the crown, where they pupate. A full-grown larva is nearly an inch long, dirty white in colour, and marked with rows of grey spots. Its head is dark brown and the first segment of a lighter brown colour. It pupates in a loose silken web on the exterior of the crown of the tree.

The following preventive measures are recommended: 1) Spraying with arsenate of lead (1 lb. to 50 gallons of water) in the form of a mist-like spray. This is directed principally against early broods and should be applied early. All trees, profitable or unprofitable, that are liable to be attacked in the neighbourhood should be sprayed. 2) Maize grown as a trap-crop and destroyed immediately the grubs are approaching full size. 3) Destruction of all infested fruit, such as peaches, etc. 4) Avoid planting maize, except as a trap-crop, near orchards.

1129 – Deformation of the Flowers of *Fraxinus Ornus* caused by *Eriophyes fraxini.* — SIRENA, CORLEO SIMONE. Alcune deformazioni del *Fraxinus Ornus.* — *Malpighia*, Year XXX, Part V-VI, pp. 512-517. Catania, 1913.

The author has observed certain peculiar gall-like formations on the flowering branches of *Fraxinus Ornus* growing near Palermo. These growths appear here and there on long or more frequently short stalks as irregular shaped masses, somewhat flattened and lobed, of a reddish-brown colour, turgid and more or less glandular. According to the writer they represent floral axes, the numerous protuberances of which are small groups of deformed and aborted flowers surrounded by the rudimentary floral organs. In some of them a small circular depression is noticeable in the centre, corresponding, perhaps, to the receptacle, but no trace of the pistil is discernible.

These malformations are caused by an acarine pest, *Eriophyes fraxini*, more commonly known as a parasite of the common ash (*F. excelsior*).

The writer has observed that these aborted floral receptacles secrete a sugary liquid which is devoured by ants. This is remarkable, since the flowers of *F. Ornus* do not normally secrete nectar; it may be accounted for by the great quantity of sugar occurring in the sap, especially in summer. Owing to the excessive turgesence of the swellings produced by the insect this sweetish secretion is exuded. It seems to be the first record of secretions from acarid galls.

ALFREDO RUGGERI, *gerente responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Agricultural Meteorological Service in Germany

by

the late Dr. R. Börnstein,

Professor at the Berlin Agricultural College.

The present meteorological service in Germany was instituted in 1906, but previously several State and private institutions had done similar work. Thus the German Sea Observatory (Deutsche Seewarte) founded in 1876 in Hamburg had begun to issue weather forecasts for Germany, besides attending to meteorological observations along the coast and to storm warnings. But after only a few years (1884) the weather forecasts were discontinued. Then State Institutions undertook the publication of weather forecasts for the inhabitants of the country, namely in the Kingdom of Saxony in 1878, in Bavaria and in Württemberg in 1881, in Baden in 1882 and in Alsace-Lorraine, besides which there were private observatories in Berlin, Magdeburg and elsewhere which had been started in accordance with the wishes of the press. Plenty of experience collected both at home and abroad was thus available when the present service was organized.

The object aimed at was that the State service should in the first place spread rapidly and cheaply the results of the observations made, leaving the receivers of such information, especially farmers, the task of drawing the necessary conclusions from them and forecasting for their own locality the probable weather. By this means it is possible to utilize for weather forecasts the great and valuable experience which practical farmers possess, besides which the farmers are left more time to prepare their forecasts than the directors of the meteorological stations can dispose of, at the latter must telegraph their forecasts as early as 11 a. m., while the farmers can continue for a few hours longer to observe the weather before considering the approaching changes.

The complete execution of this plan would entail the total abolition of official forecasts and the limitation of the service to the simple dstribution of the weather charts. But in order to render this feasible the great mass of farmers ought to possess the necessary knowledge for the comprehension of the weather charts, without which all weather forecasting is impossible. As for the moment such knowledge cannot be reckoned upon, the weather bureau has undertaken the publication of daily forecasts, and at the same time the general spread of that knowledge which with time will render the forecast unnecessary.

The *Hamburg Marine Observatory* is the Central Office; it is at the same time one of the Service Offices (Dienstelle) of which more will be said below. It receives several times in the course of the day ciphered telegrams conveying the results of observations made at numerous home and foreign stations, with the help of which it draws up the telegrams for the home service; these, under the name of *Deutsche Abonnements-Wettertelegramme* (German subscription weather telegram), can be obtained at reduced prices from all the German telegraph stations. These cipher telegrams are of three kinds:

1. The first *Wetter-Abonnement Telegramm* according to the formula *BBBWW SHTTA RB'B'VN*, contains the morning observations of 58 stations; it leaves Hamburg at 9.15 a. m., and costs 20 Marks (about £1) per month.

2. The *Abonnement Extra Telegramm*, according to the same formula, gives the morning observations of 21 other stations. It leaves Hamburg at 9.45 a. m. and costs 10 Marks (about 10 *s*) monthly.

3. The *Abonnement Nachmittags Telegramm* according to the formula *BBB WW SHTTV'*. It contains the afternoon observations (2 p. m.) of 30 stations, and leaves Hambourg at 4 pm and costs 10 Marks monthly.

In the above, *BBB* signifies the three figures of the barometer reading, omitting the first 7 and the decimal point, thus giving the tens, units and tenths of millimeters, of course reduced to 0° C. and sea-level. The fourth and fifth figures, *WW*, indicate the direction of the wind, the figures from 00 to 32 being supposed to be disposed in a circle like the points of the compass, so that 32 represents the north, 08 east, 16 the south and 24 west. Consequently 04 signifies north-east, 06 east-north-east, and so on.

The sixth figure, *S*, stands for the force of the wind according to Beaufort's scale. When this is above 9, the figure 9 is used and the force of wind given in words at the end of the telegram.

The seventh figure, *H*, gives the state of the sky, namely 0 cloudless, 1 fine, 2 half overcast, 3 cloudy, 4 overcast, 5 rain, 6 snow, 7 mist, 8 fog., 9 thunder storm.

The following two figures, *TT*, indicate the temperature of the air in round numbers, the decimal 0.5 being rounded upwards. Only in the neighbourhood of zero the following notation is adopted:

— 0.5°	95	+ 0.1°	41
— 0.1°	91	+ 0.2°	42
0.0°	00	+ 0.5°	45

Further, *A* indicates the trend of the barometer, that is the change in pressure during the three hours from 5 to 8 a.m. rounded up to whole millimeters. The minus sign before *A* when the atmospherec pressure is falling is indicated by an increase of 50 in the figures *WW* representing the direction of the wind.

R shows the amount of rainfall during the last 24 hours according to the following scale: 0 = 0 millimeter, 1 = 0.1 to 0.4 mm., 2 = 0.5 to 2.4 mm., 3 = 2.5 to 6.4 mm., 4 = 6.5 to 12.4 mm., 5 = 12.5 to 20.4 mm., 6 = 20.5 to 31.4 mm., 7 = 31.5 to 44.4 mm., 8 = 44.5 to 59.4 mm., 9 = not reported.

B'B' indicates the barometric pressure of the preceding evening; the first 7 is omitted and the reading is rounded up to whole millimeters.

V signifies, at the German stations, the state of the weather during the last 24 hours, namely: 0 fine weather prevailing, 1 fairly fine (cirrus clouds), 2 cloudy (low clouds), 3 lightning (more than one flash), 4 morning rainfall, 5 afternoon rainfall, 6 night rainfall, 7 thunderstorm (at least one thunder-clap and one flash of lightning or several thunder-claps without lightning; requires always some short addition of words), 8 rainfall in showers, squalls, changeable, occasionally clearing up, some sunshine, 9 continuous rain during a great part of the day or general rain with mostly overcast sky. Between 0 and 3, at most 0.4 mm. of rainfall is assumed and the afternoon cloudiness is especially important; from 4 to 6 more than 0.4 mm. of rainfall is assumed but no thunderstorm, or at most one thunder-clap without lightning. In foreign stations the cipher *D* is used to complete the data of some German stations. *N* is the first number of the successive numbers accerding to which the stations follow each other in the telegram. Lastly *V'* (in the afternoon telegram) signifies the kind of weather it has been between the morning and afternoon observations, namely: 0 mostly fair, 1 tolerably fair, 2 mostly clouded, 3 lightuing (0 to 3 dry), 4 slight rainfall, 5 heavier rain, alone or with snow or sleet, 6 heavier fall of snow (alone or with some rain or sleet), 7 thunderstorm, 8 rainfall in showers, 9 continuous rain.

The whole country is divided into *meteorological service districts* in each of which a station (*Dienst stelle*) is situated, besides which some districts possess sub-stations (*Nebenstellen*). At present the stations and sub-stations (in brackets) in Germany are the following: Hamburg, (Flensburg, Oldenburg), Berlin, Königsberg, Bromberg, Breslau, Magdeburg, Frankfurt a.M., (Giessen, Saarbrücken), Ilmenau, Werlburg, (Cassel, Coblenz), Aix-la-Chapelle, (Bonn, Dortmund, Essen), Dresden, (Planen, Wurzen, which does not issue charts but only forecasts), Münich, Stuttgart, Carlsruhe, Strassburg.

On the annexed map the North German stations and the boundaries of their districts are marked in red, while the limits of the forecast districts and the sub-stations are shown in green.

These stations have the duty of following uninterruptedly the course of the weather and of delivering reports daily, Sundays and holidays not excepted, upon the actual weather and upon what is expected. As a basis for these reports, besides the Hamburg weather telegrams, telegraphic and postcard reports from the district itself are received and used. These are sent regularly and also whenever any meteorological event of special interest occurs (such as cloudbursts, hail or thunderstorms). Besides the above, reports on the water-level of the most important streams of the district and special observations are also sent in.

On the basis of these communications and observations the station has to prepare daily a weather chart and by means of a simple process to make rapidly so many copies of it that the printed chart (which, besides the synoptic graphs of the weather made at 8 a. m. contains some observations made in the district itself, namely water-levels, a review in words on the weather since the preceding day and a forecast for the next day) is ready to be mailed at 11 o'clock in the morning and wherever possible it reaches the subscribers before evening.

This result has not yet been completely attained, though there is no doubt that the value of the weather chart depends only upon its rapid distribution and almost disappears when it is distributed on the following day. There are, however, numerous localities in which the post is delivered only once a day and by a postman who starts from the railway station in the morning before the arrival of the weather chart for that day, which takes place in the afternoon. In such places the chart is already twenty-four hours old when it is distributed, and its value is very much reduced. In order to remove this inconvenience, since the middle of October 1912 at the Hamburg station the experiment is being made of issuing a second weather chart in which the evening observations up to 8 p. m. are given, and which is ready for the post by 9 p.m. As this is but little over 12 hours old when it is distributed, it can be very useful in all those places in which the morning chart does not arrive in time. The general introduction of this evening chart together with the morning chart would be very desiderable, but considering its cost it has not yet passed the experimental stage.

The price of the weather charts is kept as low as possible; it is generally 0.50 Mark (about 6 *d*) per month, of which 0.14 Mark (about 1 $^{3}/_{4}$ *d*) is postage expenses; in the Strassburg district it is 0.60 Mark (about 7 ¼ *d*) and in Bavaria inclusive of postage 1 Mark (about 1 *s*). In the Weilburg district the price for schools has been reduced - for an experiment - to 0.40 Mark (less than 5 *d*) including postage, when all the schools of a school district subscribe for a whole year. The total number of weather charts daily distributed in Germany amounted in the summer of 1912 to about 13000; in winter the number was smaller. In many places such as schools, post offices and the like they are hung up to the public, and mostly those for three consecutive days. Besides this the weather charts are daily reprinted by many newspapers.

The Station has further to prepare daily the weather forecast which covers from midnight to midnight and to supply it in a sufficient number of copies (for the various lines) by 11 a. m. to the nearest telegraph station. As, however, the districts of the Stations are too extensive for one weather forecast, they have been divided according to their climatic

INSTITUT INTERNATIONAL D'AGRICULTURE

Bulletin mensuel des Renseignements Agricoles et des Maladies des Plantes

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La Ière Partie donne, comme *Aperçus originaux :* 1. Le Service de Météorologie agricole en Allemagne, par le Dr. Börnstein, professeur à l'Ecole Supérieure d'Agriculture de Berlin. - 2. La Culture des Tourbières en Autriche, par le Dr Bersch, Inspecteur de la Station I. R. expérimentale de Chimie agricole de Vienne. - 3. Résultats des récentes Expériences de Fumure faites à l'Office agricole central de Stockholm, par M. Söderbaum, Chef de la Section de Chimie agricole du dit Office. - 4. Les Conditions actuelles de la Sylviculture en Italie, par le prof. L. Piccioli, Inspecteur forestier de Catanzaro. - 5. Le Jardinage dans l'Economie forestière, par M. Kubelka, Directeur de la Station I. R. d'expériences forestières de Mariabrunn près Vienne. 6. Résultats obtenus en Hongrie par l'emploi des Distributeurs d'Engrais en lignes, par M. Coloman Kerpely, Directeur de l'Académie agricole à Debreczen.

Les *Articles analysés* de la IIe Partie donnent d'abord des *Renseignements agricoles*. Après des *Renseignements généraux* concernant: Mesures législatives, Enseignement et Expérimentation, Expositions, Concours et Congrès, on étudie la *Production végétale* dans une série d'articles, notamment : Le Réveil de la Terre, étude sur la période de nitrification intense au printemps - Mouvement général du Nitrate de Soude à la fin du 1er Semestre 1913 - La Décomposition des Feldspaths et son emploi, pour la fixation de l'Azote atmosphérique. - Recherches sur la Variabilité des Sexes chez le Chanvre et l'Oseille - Expérience sur l'ensemencement dense et clair du Blé à la Ferme Gouvernementale de Chapman, Austra ie méridionale (Communication originale) - Culture du Citronnier à la Dominique. - Parmi les articles consacrés à la *Production animale*, on peut citer : Recherches expérimentales sur les relations entre la Tuberculose humaine et la Tuberculose bovine. - Méthode pour déterminer l'état de Gestation dès le début chez la Jument. - 4 articles concernant l'Engraissement des Veaux, des Porcs et de la Volaille - Dans le *Génie rural*, on étudie entre autres : Développement de la technique de la construction des Machines agricoles - Abreuvoirs pour Bétail dans les Pâturages tourbeux. - Parmi les 5 articles d'*Economie rurale*, on lira avec intérêt : Frais d'Exploitation dans les grandes propriétés au Sud des Etats-Unis - 3 articles sur les *Industries agricoles* terminent les Renseignements agricoles proprement dits.

Dans les chapitres consacrés aux *Maladies des Plantes*, on peut signaler entre autres : La Chlorose « calcaire » des plantes vertes - Action défavorable des Anticryptogamiques et Insecticides sur la germination du Pollen des Vignes. - Résultats de la lutte contre l'Oïdium américain du Groseiller en Russie. - Sur diverses Bactéries isolées de Vignes européennes et américaines affectées du « Roncet » - *Bacillus vitis*, nouveau Schizomycète des Vignes américaines en Ligurie - On décrit enfin plusieurs Insectes nuisibles aux diverses plantes, en indiquant les moyens de lutte.

conditions (and partly also according to their telegraph lines) into forecast districts (shown in green on the annexed map) and the stations are authorized to send different forecats for these sub-districts. After some unsuccessful experiments in shortening the forecast by using code words, this is at present transmitted in plain language; not more than eight words are allowed, the average number being five. During the summer service (May to September inclusive) this forecast is hung up shortly before noon in all German telegraph offices and its communication by telephone may be had from the telegraph offices on payment of 0.10 Mark (about 1 ¼ *d*).

The subscription for regular communication of the forecast costs: by telephone or ordinary post 2 Marks (about 2 *s*) per month; quarterly 4.50 M.; half-yearly 8 M.; by country postman 3, 6.75 and 12 M. respectively; by express messenger (besides cost of rural messenger) 4, 9 and 16 M. In winter the forecasts are only hung up where a special subscription is paid (2.50 Marks per month). This happens in some towns at the request of the civic authorities. It is hoped in future to extend the summer service to November 1, as would be desirable in the interests of the vine and fruit-growing industries.

The *Sub-stations* like the Stations receive, the information necessary for the preparation of the weather charts and besides this they get from the Stations partly by telegraph and partly by telephone the general review of the weather to be published on the chart and the forecast. Usually before drawing up the forecast a short telephonic conversation takes place between the Station and the Sub-stations during which observations and considerations are exchanged. The final drawing up of the forecast is expressely entrusted to the Stations.

In order to keep the whole Meteorological Service in close touch with practical agriculture, in most districts reliable collaborators (*Vertrauensmänner*) have been appointed. These are practical farmers, teachers of agriculture and the like, at least one in each district, who constantly devote their attention to the Meteorological Service; they express their opinion on the weather forecast and follow all the details of the work. Their criticism of the forecast is expressed in figures and sent every week on post-cards to the heads of the Service. The value of these "percentages of hits" is not very great, as the judgment cannot be kept perfectly free from individual valuation, and besides the economical significance of correct forecasting varies very much; thus, at a change of weather a correct forecast is much more valuable than during a long period of the same weather. For these reasons the "percentage of hits" and the comparison of those of different districts are not published; nevertheless, they often give the directors of the Service useful hints and have thus, in spite of many objections, been kept up. Further, the Vertrauensmänner transmit to the directors many of the wishes and proposals arising from the daily practice of farming, and in this manner many valuable improvementes have been made in the meteorological service.

As has already been said, the most important duty of the meteorological service consists in the timely sending off of the daily weather charts, that is the spread of the observations of facts that have really happened, while the official forecasting is destined to become gradually less indispensable. Of course this aim cannot be reached until the great majority of the people, and especially of the farming classes, are in a position to understand the weather charts and to consider their own local weather in connection with the state of the weather in the whole of Europe. It has thus been made an especial duty of the directors of the Service to spread knowledge on the objects aimed at and methods followed by the Meteorological Service, as well as on the limits of its capabilities.

Lectures and discussions in meetings of associations, especially agricultural and educational, as well as special courses for teachers and the inclusion of meteorology in the curriculum of seminaries and universities, provide both for making grown-up people acquainted with the principles of meteorology and for introducing this branch of science into the schools.

Moor Cultivation in Austria

by

Dr. Wilhelm Bersch,

Inspector at the Imperial and Royal Experiment Station for Agricultural Chemistry, Vienna.

Methodical and systematic efforts to encourage the cultivation of moorland were begun much earlier in Germany and Sweden than in Austria. The Moor Experiment Station at Bremen was founded in 1879, and to the work of this institution we are indebted for laying the foundations of our knowledge of the formation, structure and efficient treatment of peat soils, and in particular for the modern method of cultivation, which has taken the place of firing the moors. The Experiment Station of the Swedish Moor Cultivation Society at Jönköping began its activities in 1887; as Sweden also contains vast stretches of moorland, its area of work is as large as that of the Bremen Station. The area of moors in Germany is stated to be about 7 000 square miles.

The situation in Austria is very different: whilst in Germany moors frequently form enormous uninterrupted tracts of waste, largely State property, Austria possesses a large number of moors of small extent, almost all of which either belong to private persons, particularly needy small-holders, or are common-land. Under these circumstances, the far-reaching schemes of colonisation on a large scale, which at present form the main feature of the State-aided endeavours towards moor-cultivation in Prussia, are out of the question in Austria; here the problem is to establish numerous profitable small holdings and to put many thousands of acres of moorland to the most suitable use, a use which is also of the greatest importance for the development of our stock farming, *viz.* the growing of fodder crops, for which no soil is anything like as well suited as properly cultivated moorland.

The model for Austria was provided by numerous instances of highly successful starting of moor cultivation in Germany and Sweden. It was soon found that, with slight and generally unessential alterations, all that had been learnt elsewhere could be applied in our country. These alterations are occasioned not by any difference in the characters of our moors, but chiefly by climatic influences. Moor belongs to the type of soil which offers the greatest obstacle to the passage of water, surpassing even clay in this respect. As many of our moors, especially those in the Alps, occur in very rainy districts, particular attention must be paid to the proper regulation of the ground-water. It is obvious that the draining of a moor, which is a primary condition for its reclamation, cannot be carried out in regions with a rainfall of 1200 to 2000 mm. (48 to 80 in.) in the same manner as in North-West Germany and Galicia where the precipitations amount to only between 500 and 700 mm. (20 to 28 in.).

Our moors show no essential differences in chemical composition and botanical origin from those of other lands, as has been shown by the numerous investigations of the Moor Cultivation and Peat-Utilization Section (" Abteilung für Moorkultur and Torfverwertung ") of the Vienna Station, founded in 1901. It is true that many of the Austrian moors on the Primary rocks show a somewhat higher potash-content, but the total amount is small and it occurs in a form soluble with extreme difficulty, so that — as with phosphoric acid — potash in the form of an artificial manure must be applied. As regards nitrogen-content also, our moors are in agreement with those of other countries. The true moors are generally very poor in this nutrient material and consequently always require nitrogen-manuring, while the fens are generally much richer and contain the nitrogen in a more readily soluble form, so that they can frequently do without any addition of nitrogen. There are, however, exceptions : many fens, especially before the peat is much decomposed, dispose of such small quantities of assimilable nitrogen that their full cropping capacity cannot be reached; such fens, at any rate in the first few years of cultivation, respond well to nitrogenous dressings.

The climate, and in particular the heavy rainfall, also leads to a modification in the application of the manure. While basic slag and potash are normally applied in the autumn in districts with low rainfall, spring dressings have proved more suitable at the Admont farm of the Vienna Experiment Station. In the first place it has been found that the action of the manures is just as quick when they are not applied till the spring and secondly it is obvious that in this way the unavoidable loss of plant-food owing to the considerable leaching of the soil is reduced. The knowledge of this fact is a great relief to the moor-farmer of the Alpine region ; for he can wait quietly for the warm season to set in, with the certainty that thoroughly good results will be obtained if he applies his manures at the end of April, or even if necessary not till early May. Manuring and seeding frequently take place on the same day, and this produces no bad effects when the preparation for roots and grain crops does not take place till the end of April, and grass-seeds are sown in May. Peat is a bad conductor of heat, and a considerable time must elapse before the soil gets sufficiently warm for the seeds to begin to germinate. Late sowing avoids the disadvantage of having the seed lying too long in the wet and cold ground, and gives a much more regular germination; the relatively considerable warmth which very soon sets in in the Alps induces much quicker growth, so that the difference between early and late sown crops disappears in a few weeks.

Spells of bad weather are frequent in the spring in the Alps, and the snow melts gradually, so that the soil remains sodden and cold; for this reason thorough spring cultivation cannot be managed without long delays disadvantageous to the farmer, and autumn ploughing becomes an absolute necessity. Moor soil must as far as possible be got ready to receive the seed in the autumn, so that only harrowing is required in spring. Besides its generally recognized advantages, autumn ploughing is specially valuable for moor cultivation, as it gives full opportunity for the frost to exert its loosening and opening action on the insufficiently decomposed peat. In this way the teams are spared a great deal of work and the soil soon takes on a fine tilth, so that the main condition necessary for thriving crops is fulfilled. Only on thoroughly tilled soil, sufficiently decomposed and loosened, will drains run evenly, and the same conditions are necessary for even germination of seeds and regular development of the young plants. The importance of this in growing fodder crops—the most valuable form of utilization of moorland — is obvious. Only with thorough tillage and a finely decomposed surface is it possible to get an even closed grass-covering; but when this is obtained, the meadow gives yields generally far exceeding those of the best artificial grassland on mineral soils and has the particularly valuable property of keeping up its production even during long periods of drought, thanks to the well-regulated supply of moisture on properly drained moorland.

Owing to the heavy and generally regular rainfall in the Alps, the first operation for the reclamation of a moor is drainage, and this must be carried out with the greatest care. At the same time, the conditions are more favourable here than in less rainy districts, in that the consequences of excessive draining are generally not so much to be feared, since the rains and heavy dews always provide sufficient moisture for the soil. Excessive draining should, however, be avoided, as it is ultimately detrimental and is inseparable from heavy expenses, which unnecessarily burden the improvement accounts. Drainage should therefore be restricted according to local requirements; in particular, where artificial meadows and pastures are to be formed excessive drainage should be guarded against; in general the leading principle holds good that moor soils should be more thoroughly drained for arable crops than for artificial meadows, and pasture also requires more drainage than meadow to prevent poaching by the cattle grazing it.

The important question whether open drains or tile drains are to be preferred for moorland has been settled in principle in favour of the latter. In these rainy regions, where the drains must be close together, the laying out of a system with only open drains would mean such a cutting up of the land that the advantage of tile drains is clearly evident on purely practical grounds. Open drains also need continual inspection, and keeping them in proper condition involves expenses which are not required for tile drains; the cost of making bridges and the loss of cultivable surface are also to be set against open drains. Further, with open drains pastures can only be arranged by the use of special devices (fences, etc.) for the protection of the ditches from the cattle. Lastly tile drains generally give a more efficient drainage than open ones. As soon as frost sets in on the moor soil, and of course also in the open drains, layers of ice form on the sides and bottoms and stop the running of the drain; in spring no water can run off till these ice layers are melted, which is often quite late after severe winters, owing to the low heat-conducting power of peat. Tile drains, if laid deep enough, carry off the ground-water even in winter, and so allow the soil to warm up from below; consequently tile-drained fields are generally free from snow and dry and ready for working earlier, and for all these reasons are two or three weeks alread of those drained only by open ditches. All these considerations are in favour of the wide-spread adoption of tile drainage; open drains have the one advantage of supplying plenty of material for levelling, which would otherwise have to be obtained by making diggings on purpose. In the rather frequent cases in which levelling of the land to be reclaimed is necessary, the matter can be dealt with by a combined system of open ditches for the mains and tiles for the minor drains. The collecting ditches into which the minors empty should then be arranged regularly, and if possible parallel to one another; they may be as much as 200 yds. apart, and in this way allow of pastures being laid out, as only the main ditches need fencing to keep the banks from being troddendown by stock.

One of the numerous differences between fens and moors is that the former are mostly rich in lime and decompose quickly after drainage, with its consequent aeration, and regular working, while the moors with their low lime-content only slowly take on the crumb structure. The decomposition of moor-peat is greatly helped by a single dressing of lime as quicklime, marl or carbonate of lime, provided the lime material is thoroughly mixed with the cultivable soil. Under North German conditions a sufficient liming has been shown to be 1800 lbs. of quickline, or its equivalent in marl, for arable land, and 2700 to 3600 lbs. for grassland per acre of moor; heavier dressings generally do damage to the crops. In the Alps and also in Bavaria, whose moors and climate have much in common with those of the Alpine districts, it has been found that though such dressings can be applied without harmful results, the same effect is produced by smaller amounts, about half, always provided the soil is very thoroughly worked. It would take us too far from our subject to discuss the causes of this phenomenon in detail; but it seems to be attributable to the higher summer temperatures, and perhaps also to the severity of the winters, which encourage and hasten the chemical and physical processess leading to the decomposition and reduction to earth of the moor-peat (1).

In North-West Germany good results have been obtained, especially on large areas of true moor, by inoculation with nodule bacteria, which allow of nitrogen-assimilation on the part of Leguminosae; this method was introduced there by Saalfeld. Without such inoculation, which is generally carried out by spreading soil containing the bacteria, the growimg of leguminous crops is not practicable except by addition of sufficient quantities of nitrogenous manure. The conditions are different on the moors of our Alpine districts : here the nodules form well without any inoculation, so that artificial introduction of the nodule organisms is superfluous. This is attributable to the small extent of the individual moors in our country ; those of over 250 acres are by no means common and belong to the larger estates. As they are mostly surrounded by cultivated mineral soils it is evident that soil inoculation will have no special effects, as it is already carried out regularly by the wind. It succeeds in spreading particles of soil laden with nodule organisms evenly over comparatively small areas, but does not extend its action to the extensive tracts of moor in North-West Germany, so that there soil inoculation will continue to play an important part, at any rate as long as the bulk of this moorland remains unreclaimed.

In spite of the small extent of most of the Austrian moors, particularly those of the Alpine districts, moor cultivation is of great importance for the districts concerned. From the official moor-statistics (2) drawn up by the Moor Section of the Vienna Experiment Station, it appears that the moor property on crown land in Lower and Upper Austria, Salzburg, Styria, Carinthia, Carniola, the Tyrol and the Vorarlberg comprises some 81 500 acres ; this does not include the very abundant grass moors (« sauren Wiesen ”), which are to be reckoned as moors in course of formation and require similar treatment for reclamation, though they do not supply utilizable peat. The average yield of good artificial meadows on moor soil may, according to all experience, be set down at 56 cwt. of first-class hay per acre ; but it frequently reaches much higher figures, especially on fens, even 80 cwt. or more. The reclamation of the Austrian Alpine moors would thus mean a very important increase in the production of first-class fodder, and consequently in the number of cattle kept — and this without considering the increased value of the land. Thus, while moor in its original condition gives practically no yield, it can be permanently improved with normally small expenditure, and the moor soil then forms the best and kindliest cultivated soil we possess.

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(1) For further information, especial on the draining, cultivation, manuring, etc., of moors, see : BERSCH, Handbuch der Moorkultur, 2d. edition. — Vienna, Wilhelm Frick, 1912.

(2) “ Nachweis der Moore in Niederösterreich, Oberösterreich, Steiermark, Kärnthen, Krain, Tirol und Mähren ,,. Prepared by the Imperial and Royal Experiment Station for Agricultural Chemistry of Vienna, by order of the Ministry of Agriculture. Published, under instruction, by Wilhelm Frick 1911.

The conditions in Austria are such that the moor-farmer — at any rate in the Alpine districts — can rarely bear the whole expense of the improvements, as he lacks not only the confidence and the practical experience necessary but also the means. The confidence of the farmer is first gained by courses of instruction and lectures, and by the establishment of model moor-meadows ; the p'ans for the improvement are then drawn up at the expense of the Central or Local Government, and the authority in question provides substantial assistance, generally amounting to 60 per cent. of the total expenses, to the Drainage and Moor Cultivation Cooperative Society (1) ; finally, further support is given in the shape of implements for working the moor soil, artificial manures and grass-seeds. In this way it has been possible in many places to convert almost wholly unproductive moors into first-class artificial meadows, and thus to encourage cattle breeding and at the same time to furnish examples of the advantages of cooperation in this direction.

The cooperative production of peatmoss litter is also encouraged by the Government, by the provision of machines for its preparation. Moors which were formerly left idle, or at most formed pasture of the poorest quality, now enjoy the appreciation which is their due, and this finds expression in the increase of prices of moorland.

Whilst, as far as climate allows, almost any moor can be used as arable land, yet the production of fodder is the most profitable use to which moorland can be put, and this type of farming gives as good results in Austria, and particularly in the Austrian Alps, as elsewhere.

Experimental Results obtained of Recent Years by the Section of Agricultural Chemistry of the Central Agricultural Experiment Station of Stockholm

by

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Chief of the Section.

I. — NITROGENOUS MANURES.

1. *Experiments with new nitrogenous manures or substances proposed as such: cyanamide, nitrate of lime, dicyandiamide, cyandiamidine.* - Both wheat and rye have proved much more sensitive to cyanamide than oats. An addition of 0.75 gram of nitrogen, under the form of cyanamide, per pot containing 26 kg. (57.2 lbs.) of earth, which did not cause the slightest harm to oats, acted so unfavourably upon wheat and rye, — even when applied

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(1) See also: "Moorkultur und Torfverwertung auf genossenschaftlichen Grundlage in Oesterreich,, by Dr. WILHELM BERSCH, in *Jahrbuch der Moorkunde*, Year 1, 1912. Hanover, M. and A. Schaper, 1913.

a week before sowing, — that the majority of the plants died within four weeks. Only after sowing again did the plants develop quite normally.

As for the increased yield in grain, cyanamide gave with wheat 68.2 to 80.2, and with oats 30.8 to 64.1 per cent of the effect of nitrate of soda. For the total yield the corresponding figures for wheat were 61.8 to 68.4 and for rye 44.8 to 66.5 per cent.

With oats the action of cyanamide was much nearer that of nitrate of soda. The observed relative increases of yield were, considering the increase due to nitrate of soda to be = 100, for grain: 98.2 to 99.1, and for the whole crop 91.6 to 93.9.

With cyanamide manuring the nitrogen content of the straw was always greater than with any other form of nitrogen.

Nitrate of lime in its effects on rye and oats stood on a level with nitrate of soda; on wheat, on the contrary, especially for the yield of grain, it proved decidedly inferior.

Dicyandiamide caused unmistakeable signs of poisoning in oats and their yield was inferior to that of the lot without nitrogen. The application of dicyandiamidine under the forms of sulphate or phosphate also caused the plants to be sickly and to develop very scantily.

2. — *Experiments with sulphate of ammonia.* — The plants experimented upon were oats, barley, wheat, rye, carrots and potatoes. The sulphate of ammonia had throughout very good effects on oats, and especially so when the phosphoric acid was given under the form of bone meal or basic slag. If the action of nitrate of soda be taken as 100, that of sulphate of ammonia ranged from 90.8 to 195.8. The variations in favour of ammonia were thus as a rule much greater than those observed with nitrate of soda. As for barley, a mixture of nitrate of soda and sulphate of ammonia in equivalent quantities gave somewhat better results than nitrate alone. As exclusive source of nitrogen, ammonia gave much worse results. With rye, ammonia was somewhat superior to nitrate, while with wheat the reverse was the case. Carrots and potatoes on the whole profited equally by either nitrogenous manure.

3. *Top dressings with cyanamide alone or in conjunction with nitrate of lime.* — Experiments with oats in which, besides cyanamide, the following manures were applied and their effect as sources of nitrogen compared with each other: nitrate of soda, nitrate of lime, and mixtures of cyanamide and nitrate of lime in the proportions of 1 : 1 ½ (A) and 2 : 1 (B). All of these manures were given in one set of experiments eight days before sowing, and in another as top dressings after the plants had appeared.

a) Nitrogenous manures applied before sowing.

Nitrate of lime proved equal to nitrate of soda. Also the effect of cyanamide was quite good and on the grain yield was even slightly better than nitrate of soda. The mixtures of cyanamide and nitrate of lime gave higher yields than either of the two by itself. Mixture B was the best. Even when double doses of nitrogen were given no ill effects caused by cyanamide were observed.

b) Nitrogenous manures used as top dressings.

The effect of both nitrates, and especially that of soda, is notably increased when they are used as top dressings; on the contrary all the mixtures containing cyanamide proved injurious when given in this way; in some cases the plants experimented upon were enfeebled and in others they were completely destroyed. Consequently cyanamide gave lower yields than the lots without nitrogen.

4. *Experiments with so-called basic nitrate of lime and "granulated" cyanamide on oats.* — The effect of the above manures was compared with that of nitrate of soda and of sulphate of ammonia. When the nitrogenous manures were mixed with the soil in single doses, basic nitrate of lime gave the best result, while in double doses sulphate of ammonia was superior. In the first case the differences were so slight that the effects of nitrate of lime may be considered approximately equal to those of nitrate of soda and of sulphate of ammonia. The action of the "granulated" cyanamide was somewhat inferior. As in the preceding experiment, cyanamide as a top dressing caused either the death of the plants or a temporary weakening.

5. *Comparative manuring experiments with nitrate and ammonia on turnips.* — It was found that ammoniacal nitrogen was on the average more favourable than nitric nitrogen. If the increase of fresh roots obtained by nitrate of soda be set equal to 100, the corresponding increase caused by sulphate of ammonia was 145,4. The weights of the dry matter in the crops stood as 100 : 126.7. The results tally with those obtained in previous field experiments.

II. Phosphatic Manures.

1. *On the after-effects of some phosphates.* — The following series of experiments, which extended over five years, were carried out on pots containing 25 kg. (55 lbs.) of sandy soil, with the object of determining the relative manurial values of superphosphate, precipitated dicalcium phosphate, precipitated tricalcium phosphate and steamed bone flour. The plants employed were oats and barley. The experiments show that the total effect of the manures during the five years is superior in the case of the lighter soluble phosphates. The effect of the dicalcium phosphate was about equal to that of the superphosphate. Both of them were decidedly superior to that of the less soluble phosphates (bone flour and tricalcium phosphate) and this also in those cases in which (as with bone flour) the results during the first year had been equal or nearly equal to those obtained with superphossphate.

The effects of superphosphate and of dicalcium phosphate during the whole five years were not, in the main, influenced by the addition of calcium carbonate, while on the contrary the effects of bone flour and of tricalcium phosphate were much reduced and finally completely obliterated by calcium carbonate. The partial substitution of nitrate of soda by sulphate of ammonia has almost always slightly increased the utilization by the plants of the less soluble phosphates.

The results of the experiments are in opposition to the frequently advocated opinion that the lower direct effect of the less soluble phosphates is compensated by their abundant after-effects.

2. *On the manurial value of some phosphates.* — The following phosphates were experimented upon: *a*) Tunisian phosphates; *b*) precipitated bone phosphate; *c*) electrolytically precipitated dicalcium phosphate (so-called " Palmaer phosphate ") obtained partly by rapid and partly by slow precipitation; *d*) artificial phosphate of iron, $Fe PO_4$, and *e*) so-called " Bernard phosphate ", said to be prepared by calcination of low grade crude phosphates. The experiments were carried out with oats in pots containing 26 kg. (about 57 lbs.) of sandy soil.

If the increase of crop due to superphosphate is taken as equal to 100, the effect of Tunisian phosphate was 22.2, while that of precipitated bone phosphate was between 111.2 and 116.6. The slowly precipitated dicalcium phosphate had a somewhat less favourable action than that of the normally obtained one. The increase of yield due to the phosphate of iron was about one-fifth of that due to superphosphate. Lastly the Bernard phosphate showed no effect at all.

3. *Experiments with nitrophosphate* (" *Nitrat phosphat* "). The so-called " Nitrat-phosphat " is produced by the Norwegian Hydro-electric Nitrogen Co. by treating crude phosphates with nitric acid. The manure that was examined contained 30 per cent. lime, 30.5 per cent. phosphoric acid and 3.6 per cent. nitrogen. It was thus in the main a dicalcium phosphate. As experimental plant, oats were used. The manurial value of superphosphate being 100 that of the nitrophosphate was between 100 and 107.9. The action of the phosphoric acid in this manure was thus very nearly the same as that in superphosphate.

III — VARIOUS OTHER EXPERIMENTS.

1. *Manurial value of so-called nitro-ammonia-lime* (" *Nitrammonkalk* "). Exhaustive experiments showed that nitro-ammonia-lime, a manure produced by the action of quicklime on sewage sludge, owes its favourable action chiefly to the lime it contains and only to a very small extent to its insignificant content of real plant foods.

2. *On the manurial effect of common salt.* — The experiments in this connection were carried out with oats, which were grown on a poor sandy soil not specially deficient in potash. Nitrogen was given as nitrate of soda and sulphate or chloride of ammonia, and each of these nitrogeneus manures was given with and without a quantity of common salt (3.1 gram per pot) corresponding in sodium content to the nitrate of soda.

From the investigation it resulted that the addition of common salt caused a considerable increase in the yield in those cases in which nitrogen had been given as nitrate of soda or as sulphate of ammonia, but not under the form of ammonium chloride + sodium chloride. No injury due to manuring with common salt was observed. The results of the experiment justify the conclusion that, at least in the present cases in which more than sufficient quantities of potash and phosphoric acid were already present in the manure, and the water requirements of the plants were met by watering, the increase of yield obtained by the addition of common salt is due to the direct manurial effect of the sodium chloride, and especially of its chlorine content, which further agrees with the fact that the soil on which the experiment was carried out was rather poor in this element.

2. *Experiments with radio-active manures.* — A so-called "radio-active catalytic" manure was also tested as to its manurial value. The substance, which consisted chiefly of a silicate of potash and alumina, was given in doses of 0.1, 0.5, 1.0 and 5.0 grams per pot. In all cases sufficient quantities of nitrogen, phosphoric acid and potash were given. The result obtained with oats on sandy soil was that the substance in question was completely harmless, but did not seem to promote the growth of the plants to any appreciable extent. Only with the large dose of 5 grams per pot was a small increase of crop obtained, and this barely beyond the limits of error.

4. — *Growth of plants in granite meal.* — In this series of experiments each pot contained 26 kg. (57 lbs.) of a powdered Swedish so-called "Stockholm" granite, the particles being of less than 3 mm. diameter. The experiments were conducted on the following plan:

a) Without manure.
b) Phosphoric acid + potash + lime (without nitrogen).
c) Nitrogen + potash + lime (without phosphoric acid).
d) Nitrogen + phosphoric acid + lime (without potash).
e) Nitrogen + phosphoric acid + potash (without lime).
f) Complete manure.

Of each combination three parallel pots were prepared. For the object of comparison there were also three pots with common earth taken from a field to which complete manure was added. Oats were used in the experiment.

It appeared from the experiment that the granite when completely manured or manured only with nitrogen and phosphoric acid gave yields as abundant as those from the completely manured field soil, and consequently able not only to satisfy the lime requirements of the plants experimented upon, but also their needs of potash. On the other hand, as was to be expected, this powdered granite had no effect as a nitrogenous manure and only a very slight one for phosphoric acid.

Recent investigations make it seem probable that the great effect of granite as a potash manure is principally due to its mica content.

The Present Conditions of Forestry in Italy

by

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In order to give an idea of the condition of our forest wealth and of the difficulties which are encountered in framing a single code of forest legislation without prejudice to the interests and customs of the population, it is sufficient to review rapidly the uncertain and desultory evolution of the laws in their hydraulic, economic, hygienic and pastoral aspects.

Between 1860 and 1877 every region of Italy had its own forest laws. In what had been the kingdom of Naples on the mainland, the law of Francis I of August 21, 1826, which was extended to Sicily by the decree of March 26, 1827, was still in vigour. It was perhaps wiser than the others and it might have been extended to the whole peninsula with advantage to the forest economics of the country. In Tuscany, after the edict of Peter Leopold of October 24, 1780, the greatest liberty prevailed. Piedmont obeyed the letters patent of Charles Albert, dated December 1, 1833, and January 28, 1834, and Sardinia those of September 14, 1844, and the decree of Victor Emanuel II of November 4, 1851, which was later extended to the Marches and Umbria. In Venetia and in Lombardy the decree of Eugene Napoleon of May 27, 1811, was still in force.

The Hon. Majorana Calatabiano attempted to remedy this want of uniformity in the legislation by means of the law of June 20, 1877, which is still fundamental in Italy. It is very liberal, being based on the opinion that in order to promote forestry free competition is more advantageous than monopolies and servitudes, and that when the demand is greater than the supply there would be no lack of landowners who would be induced by the prospect of profit to grow timber. In this law liberty is thus the rule and servitude the exception, the latter being limited to those cases bearing upon watercourses, upon the protection of the land against erosion, etc., and upon public health, but without any consideration of economic, climatic or aesthetic factors. There was no provision for rendering reafforestation compulsory.

This law ushered in a great destruction of forests. Whilst the area of forests under the surveillance of the administration was 12 463 543 acres on January 1, 1877, it was reduced to 7 402 395 acres on June 30, 1879, and by successive freeing from servitudes to 7 251 130 acres on January 1, 1900.

Too much trust was placed in the good effects of liberty and not enough consideration was given to the often imperious motives which induce landowners to fell their forests and to the difficulty of finding people willing to embark their capital in afforestation schemes trusting to the market conditions of a century later. Subsequent events proved that only a portion of these woods was destroyed with the object of transforming the soil they occupied into fields, meadows and vineyards, thus increasing the wealth of the country. The greater part of the forests were ruined by the excessive fellings to which the owners were driven by their straitened financial position and by the demands of the market. Concomitant causes were also the haphazard grazing and the primitive manner in which farming was carried out upon the cleared lands; usually after a few years they were abandoned to the action of the water, which leached them out and carried away the vegetable soil which had accumulated in the course of centuries.

It is believed that upwards of one-third of the forests freed from servitudes have already been ruined, and that another third is deteriorating so that before long it also will disappear. Some instances taken from official publications will give an idea of this work of destruction: In the Sila (Calabria) 77 341 acres of land freed from forest servitude were broken up and sown to rye, flax and potatoes, *the timber being burnt on the spot as it could not be sold*. In the province of Sassari (Sardinia), 407 550 acres of high forest and coppice were freed from forest servitude and the owners were left absolutely free to do what they liked with them. They paid no attention to either the preservation or the regeneration of the forests, because after the trees were felled, the unrestricted destructive grazing of all kinds of animals was allowed.

That the measures concerning the freeing of forest servitudes were very injurious and that the list of such abrogations were hastily drawn up, besides being full of errors and not sufficiently controlled, is proved by the fact that in many cases it has been found necessary to propose the reimposition of the servitude, and that in general, and especially along the Apennines and in Sardinia, many of the freed belts have become bare stony slopes, rocky precipices or steep clay banks burnt up by the sun, which seem to baffle every attempt to render them fertile or clothe them with forests by economical methods. Liebig used to say that a population that allows the fertilizing substances of its land to be carried into the sea during a century will be obliged to follow them and to emigrate, and Victor Hugo wrote: "*C'est la substance même du peuple qu'emporte, ici goutte à goutte, là à flots, le misérable vomissement de nos fleuves dans la mer*". This indeed has happened on the slopes of the Southern Apennines, where a part of the mischief is no doubt due to geological causes beyond the control of man; but by far the greater part of it is the effect of the wastefulness and neglect of man, who has paid no heed to the equilibrium of forces in nature and has not considered the far-reaching effects of his act.

There were not wanting scientists and parliamentary men who attempted to stay this continued work of destruction. But failure attended every effort to introduce a real forest law providing for the conservation and improvement of existing forests, for the afforestation and putting to grass of those lands that cannot be kept permanently under more profitable crops, for the extension of wooded pastures, for the conciliation of sylviculture with animal husbandry to the advantage of the inhabitants of the mountains, and lastly for means of prohibiting large landowners neglectful of their social duties from letting immense tracts of land go to ruin..

The Law of March 1, 1888, on reafforestation, of which the Regulations for its application were not even published, had such meagre results, that it could be considered a dead letter.

From the official statistics it appears that between 1867 and December 31, 1904, the area reafforested at the expense of the Government or with its assistance amounted to 129 302 acres, with an outlay of £131 885. Thus in 38 years the area reafforested is 27 times smaller than that freed from servitude in the second half-year of 1877. It seemed as if an adverse destiny weighed on Italian forests, and even after some disastrous inundations the remonstrances in the Chamber of Deputies failed to obtain a satisfactory solution of the forest question.

Guido Baccelli, who in spite of the ridicule of his adversaries had founded experimental school gardens and instituted Arbor Day, has the merit of having succeeded in putting through the first Bill (that of December 29, 1901) affirming the aesthetic importance of forests; this further set aside as health resorts the celebrated forests of Vallombrosa, Camaldoli and Boscolungo in the Tuscan Apennine, the Cansiglio forest in the province of Belluno and the Ficuzza forest in the province of Palermo. Baccelli also had the courage to present a Bill on April 26, 1902, subjecting to servitude every wood in the kingdom whatever its position; but this was, doomed to failure, and after having been approved by the Senate it was buried in the offices of the Chamber, notwithstanding that it contained the germs of that new feeling for forests which was so soon to bear fruit and to usher in the period of the restoration of woods. Thus on June 26 the measures for the protection of forests in the Sele catchment basin were approved. This step, for the first time in Italian legislation, affirmed the principle admitted by the Romans that forests supply the sources of rivers and regulate their course.

On March 31, 1904, the law on Basilicata came into force; in imposing the forest servitude, this recognises, besides the interests of the hydraulic and hygienic conditions, the economic factor also. It provides for exemption from land tax in favour of those who reafforest, and grants them prizes, and it authorizes the outlay of £856 400 for the regularization of the watercourses in the plain and in the mountains, including the work of reafforestation and of strengthening the slopes.

The law of June 25, 1906, on Calabria confirms the exemptions from land tax and the giving of prizes in favour of those who reafforest, and votes £935 700 for the regularization of the watercourses in the plain and in the mountains, £352 000 for drainage, and £137 400 for consolidating slopes that threaten inhabited centres with landslips.

On July 19 of the same year the law on Vesuvius was passed; it authorizes the outlay of £234 000 to repair the damage caused by the eruption and by the subsequent downpours, and to provide for the regularization of the watercourses and woods, besides a further £80 000 for the same regularization on the southern slopes of Vesuvius.

On May 5, 1907, the law on the Water Board for the provinces of Venetia and of Mantua was passed. This provides one administrative office for the control of the public waters in the provinces of Venice, Padua, Treviso, Vicenza, Verona, Rovigo, Udine, Belluno and in that portion of the province of Mantua lying between the Po and the Mincio ; this law is the beginning of a wise decentralization in the management of waters and forests.

On November 10, 1907, the measures for Sardinia were approved, and on April 5, 1908, a sum of £8 000 was voted to assist the work of improving the pastures, preference being given to those belonging to communes and associations.

On June 2, 1910, Luzzatti's law was passed for the constitution of a vast State forest domain and for the protection and encouragement of sylviculture, and on December 22 of the same year another law on the works to be carried ont on the waters and forests of mountain basins was approved. It allows the outlay of £ 198 000 in the first five years and £ 793 000 in the next fifteen years. On July 13,1911, another law on mountain basins, water control and drainage was approved.

The last statistics published (on December 31,1907) refer to the forests subject to forest servitude. The figures are reported in the agricultural land book (catasto) of 1910, together with the area of woods not subject to forest servitude ; these (including chestnut woods) are given in the following table :

	Under forest servitude	Free from servitude	Total
	acres	acres	acres
High forest	3 840 850	1 449 186	5 290 036
Coppice	3 512 340	2 470 000	5 982 340

The total wooded area from 1870 to 1910 was as follows :

In 1870, according to Maestri	In 1894, according to the *Annuario Statistico*	In 1902, according to Stringher	In 1910, according the agricultural land register
acres	acres	acres	acres
12 430 624	11 132 854	9 666 943	11 277 396

The above figure for 1910 is 17.03 per cent. of the area of the country.

The values of the imports and exports of forest produce and of forest industry during the last eleven years have been as follows :

Year	Imports	Exports
	£	£
1900	2 455 342	387 613
1901	2 557 237	412 301
1902	2 565 494	439 561
1903	2 718 190	472 271
1904	2 072 481	409 650
1905	2 202 599	300 252
1906	3 983 540	284 704
1907	4 734 132	287 440
1908	5 474 484	319 239
1909	9 355 083	237 205
1910	6 300 728	267 013

There are no precise data as to the yearly production of timber, but an approximation is given by the following table based on the calculation that an acre of high forest yields 36 cub. ft. of wood, an acre of coppice 43 cub. ft., and the 29 million acres of fields, wooded pastures, brushwood and hedges yield 7 cub. ft. per acre.

Production of timber, in cub. ft.

From high forest	From coppice	From the fields	Total
189 097 566	256 613 000	212 000 000	657 700 000

The insufficiency of normal production has been hitherto met by excessive felling, which has encroached upon the capital of timber, and by importation, which increases to an alarming extent.

The law on the forest domain has considered the difficult problem of the restoration of forests with great breadth of view and has attempted to remedy the fundamental defect of the present servitude, which on the bare lands ends by causing much harm. It is injurious inasmuch as it forbids the breaking up of the land to convert it into fields and meadows, which would often protect the soil exposed to the erosion and washing away by torrential rains: further, as it is not connected with the positive duty of reafforesting and of consolidating slopes liable to landslides, it is an encouragement to inertia. The law on the forest domain considers the problem from the standpoint of public utility, not only as connected with the hydraulic, hygienic and economic aspects, but also with the aesthetic and historical ones. Due attention is also paid to those forests which provide the only work available to the inhabitants of mountain communes. But it was not enough to provide for the defence of the soil by the improvement of the watercourses and of the forests; it as also necessary to increase our forest domain, by creating large extents of forest sufficient to meet the future penury of timber from which our country will certainly suffer. Thus betimes the administration will purchase bare lands suitable to profitable afforestation and badly managed woods, taking the place of private ownership which can ill afford to wait a long time for the returns. The administration will also exert the necessary persuasion on corporations and private owners by setting an example of good management and will also assist them by means of active propaganda, advice, technical direction, prizes and exemptions from taxation calculated to render forestry in the mountains more profitable and consequently preferable to other forms of exploitation. The forest officials should become the natural protectors and advisors of those engaged in forest industries; they must make a radical change in their tactics, which can no longer consist in perpetually threatening penalties against the destroyers of forests, as this system has proved ineffectual for the maintenance of existing forests.

For the execution of this vast programme, which includes also the reform of education in forestry, considerable sums have been voted; for the first five years (July 1, 1910, to June 30, 1915) these will vary between £ 1 150 000 and £ 1 300 000 according to the eventual surplus in the general budget of the State.

After the first trial five years, and considering the results obtained during that time, the future yearly vote will be established. A rather optimistic estimate compiled in 1910 by the Central Inspectorship of Forests for the General Budget Committee, suggested the possibility for the State of ensuring by means of an outlay of £ 6 185 000 to be spent in 25 years a forest domain which in its seventy-fifth year would be worth almost 60 millions.

Other provisions, apparently less important, but of great practical value for those who know the useful conservatism and the injurious passive resistance of bureaucracy, are those concerning the establishment of a purely technical general direction relatively independent, distinct from the water, drainage, domain, and easement services and from territorial divisions, and resembling the Water Board of Venice and the chief inspection offices of the civil engineering service.

This law, the result of much study, has a clear vision of the best way of attaining its object, and is the greatest parlimentary achievement in forest matters since the union of the kingdom.

Forest legislation has progressed considerably since 1902, and almost every year it has been increased by a new law. Now, rather than by the enactment of new laws which would risk plunging us into the same chaos that existed before 1877 and keeping us in the midst of proposals instead of facts, it would be desiderable to solve the forest question by means of the existing laws, applying them firmly and perseveringly. If there is one measure necessary to restore to the mountains their wealth of water and forests, it is the tranquil constancy of direction which will enable the owners of forests to proceed quietly and continuosly in their work like nature herself.

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The Selection System in Forest Economy

by

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The selection system (" Plenterbetrieb ") is the oldest method of forest exploitation, for it was practised when the science of forestry was still in its infancy; further it is the system of exploitation which most closely resembles the operations of Nature.

The literature dealing with the selection-forest (" Plenterwald ") is unusually rich, and there is scarcely any other question connected with forestry upon which the opinions of experts are more diametrically opposed. In the case of such a forest, it is very easy to draw false conclusions from unsuitable subjects or from the results of wrong management. The modern forester regards the selection forest with a certain lofty contempt, and thinks its existence is only justified where it affords protection or for forests under servitude.

In Austria at the present time, this system is usually confined to the upper limits of the forests and to very steep slopes and small areas under servitude which are required to furnish a yearly supply of wood. The rotation is, as a rule, fixed at from 140 to 160 years, though in exceptional cases it is prolonged to 200 years. In this manner, the selection system is very often applied to stands of trees all of the same age, and frequently of much reduced seed production owing to their advanced age. To convert such stands into a selection-forest is no easy matter, and is effected in the following way.

A careful preparatory felling is carried out for the purpose of removing from the stands all diseased trees and some of the unshapely trunks, as well as the dead ones. This is succeeded, after some years, by very careful thinning 10 per cent. at most of the mass being removed and great attention being paid to the selection of the trees which are to be felled. These thinnings, are repeated at intervals of 5 to 10 years and are carried out by removing groups of trees; due regard must be paid to the light requirements of the underwood which has already made its appearance. In case no regeneration has taken place, recourse must be had to planting.

A method of selection which entails the removal from the stands of the strongest trunks and the leaving of the diseased, unshapely and smothered ones which do not pay for felling, has no effect in promoting natural regeneration. The latter does not take place because no preparations have been made and the area thinned has been kept too dark; on the other hand, the damage due to felling and removal are clearly felt. The later clearings obtained in the same manner are generally equally unsuccessful. These failures, together with the great demands made upon the forestry staff, are possibly the cause of the selection system being regarded in Germany and Austria as an unsuitable and ineffectual method, and of its having fallen into much disuse.

Stands of the true selection-forest type occur in Austria usually in the high mountain districts, the so-called "Alpwälder"; owing to want of care and to some extent to frequent grazing by cattle, they generally make anything but a satisfactory impression.

It is no doubt the condition of these stands which has called forth the entirely unsupported statements that selection-forests yield wood of inferior quality because the breadth of the annual rings is too much influenced by the continual interchange of close and open stands; further, that such forests produce less timber than even-aged forests, because in the former the trunks are much shorter, more liable to decay and more branched.

These assertions cannot be regarded as of universal application, since the financial success of a well-managed selection forest does not suffer from short trunks, inferior quality of wood or too great abundance of branches. Forest Inspector Schatzle (Germany) has shown, for instance, that in the Black Forest of Baden the timber yield is 74 per cent.

The opinion of the well-konwn investigator Dr. Robert Hartig regarding the quality of the timber of selection forests is as follows: "The timber of these trees is of excellent quality; in the selection-forest they grow close together and in deep shade when young and are gradually given more space. Their growth often increases up to 300 years, so that the width of the annual rings only decreases slightly towards the outside. With increasing growth the quality of the wood also improves up to a great age, and thus excellent timber is produced throughout". In another place he says: "The most prized product is the fine-ringed timber from closed associations, especially the wood of stands derived from natural regeneration".

With regard to the deficiency in wood and the branching of trees of the selection forest, the Austrian investigator, Josef Wessely, in his work "Die österreichischen Alpenländer und ihre Forste", states as follows: "Growth to old wood is usually astonishingly regular. This is no less the case with longitudinal growth, though this is generally relatively greater than growth in any other direction, which is clearly due to the struggle to reach the light, and occasions a strikingly complete lignification of the stem.

"Under these conditions (large number of stems and pressure from above and at the sides) the branches are naturally unable to become thick, and the stems continue to shed them until they attain a great age; hence of the unwonted cleanness of the trunks.„

This remark of the Austrian authority referring to the stands in coniferous forests, which perhaps now no longer exist in such an original form, gives us material for reflection. We have no right to call the selection system antiquated and ineffectual so long as we cannot bring forward convincing proofs the truth of this statement.

We now come to the principal question, *viz.* how the growth and timber yield of a selection-forest compare with those of an even-aged stand grown under open conditions.

Wessely has not yet given us a definite answer to this query. He does, however, maintain that in a spruce station spruce gives a better and more sustained growth in selection forests than in even-aged high forests.

Nowadays we often meet with the view that the yield of the selection-forest is on the whole low, and that great productiveness in the latter is only to be obtained in very favourable situations. This statement is incorrect. The yield of such a forest is certainly low at first, and much time, together with skilful management, are required before it can attain its full productivity, and before soil and stand reach a condition permitting a large quantity of timber of best quality to be obtained.

In a silver fir selection-forest near Rippoldsau in the Black Forest of Baden, Prof. Schuhberg measured in 1886 an annual increase of 263 cub. ft. per acre. A selection stand covering 250 acres in the parish of Schwappach in the Black Forest increased in mass between 1879 and 1899 by 249 cub. ft. per acre per year; these are unique performances which have not been equalled in even-aged high forests with similar growth conditions.

Large yields have also been recorded in Switzerland, the true home of forests of this type. Dr. Fankhauser showed in 1908, in the " Schweizerischen Zeitschrift für Forstwesen ", that the selection-forests in that country gave an increase of from 143 to 176 cub. ft. per acre at elevations of 800 to 1200 m. (2650 to 4 000 ft. above sea-level).

From these statistics, of which the accuracy is beyond any doubt, the increase in a carefully tended selection forest far exceeds that of an even-aged high-forest stand.

The greater resistance of the former, owing to the stand being composed of trees of different ages, is now fairly well known. Such a forest suffers little from heat and frost, snow and ice, insect and plant enemies. But it is otherwise with the injuries due to man. Unrestrained felling, the use of twigs for litter, the reckless employment of the forest as a grazing ground, have wrought havoc with many selection-forests. What the latter can withstand in this direction is shown in a striking manner by the peasants' woods of the Austrian Alps. These must eventually succumb to the continuous blows of the woodman's axe, and the ceaseless injury caused by grazing cattle; but they have resisted these attacks for an extraordinary length of time, and quickly recover, should a favourable chance give them a longer respite.

Thus about ten years ago, a peasants' selection wood in Lower Austria, which was in an extremely neglected condition, came into the possession of a high-minded lover of woodlands. The new owner at once put a stop to the forest's being exploited for timber and litter; the result was a quite incredible increase in growth, and the wood at present affords a charming picture. The stand has again become completely closed and trees of all ages show luxuriant growth.

To give another example: the so-called " Grassgelack " in the Salzkammer properties, which are burdened, and at times over-burdened, with rights of grazing and the collection of twigs for litter, are treated in an almost barbarous fashion. The grazing season begins on the first of May and the famished cattle fall upon the young tree-shoots because the grass has not grown sufficiently to satisfy their hunger. The damage caused by felling and timber removal is repeated every year; nevertheless, where the soil is best the trees are thick and their growth is satisfactory; it is only on the very poor dolomitic soil that the stands show gaps and that the growth is deficient. What, however, would have happened to these areas if clear felling had been adopted?

We will now turn to the effect exerted upon the soil by selection forests. No doubt now exists that continual protection not only maintains the good condition of the soil, but also increases it. The humus layer is especially useful, as the weathering of the mineral constituents of the subsoil is largely due to its agency. It is only in troughs or basins, where a considerable quantity of leaves collect and lie, that acid humus, unfavourable to plant growth, is formed. With the exception of such cases, and leaving out of account heaths and moors, the existence of a thick covering of humus cannot be other than advantageous to the growth of woody plants.

The continuous presence of a soil-covering and of the humus layer are certainly of effect in improving the soil. The surest proof of this is given by the primaeval forests. In those of North America, which, alas, will all too soon belong to the past, the indigenous species of trees (*Abies douglasii*, *Pinus ponderosa*, *Wellingtonia gigantea*, etc.) have attained giant dimensions. These American species will never reach this size in our ordinary forests, though they would grow as large in Austrian primaeval forests as in those of America.

The soil conditions of a carefully tended selection-forest resemble those obtaining in a primaeval forest. In the former the soil is continually protected and covered, and is sheltered from the drying effects of sun and wind; the supply of humus increases, the physical and chemical composition of the soil gradually improve, the quality of the soil improves, and for this very reason the selection-forest is highly productive.

Now Fürst (Germany) has stated in his work entitled " Plenterwald oder schlagweiser Hochwald " (1885, p. 28) that the first requisite for success with the selection system, or this combined with the compartment system, is good damp soil, as only on such can our indigenous trees support heavy shading and repair injuries of all kinds. The selection system cannot be practised in poor, dry situations.

Assuming this to be correct, we must draw the conclusion that it is just in the case of poor soil that we must dispense with the very system of cultivation from which we have every right to expect improvement in the soil conditions, and are forced to fall back upon the method which appears the worst both from the forestry point of view and from that of maintaining the quality of the soil. *i. e.* we must choose the clear felling system for inferior soil. This assumption should, however, be regarded as quite unwarranted. For in the Austrian Alps there are many wooded areas which after clear felling could not be reafforested, but gradually degenerated into " Karst " in spite of every care and attention and great financial sacrifice, while neighbouring stands managed according to the selection system, but without receiving any special attention, are in a very satisfactory condition. Central Director Hufnagl has shown in his article " Der Plenterwald, etc. ", which was published in 1893 in the " Oesterreichishe Vierteljahrschrift für Forstwesen " that a selection-forest on rocky " Karst " ground with scanty soil produces an increase of timber of 93 cub. ft. per acre per year.

In this connection he says : " If we compare with this annual increase of 93 cu. ft., or, what is the same, a yield of 93 cub. ft. of timber per acre per year, the figures given in tables showing the product of stands of the same size and growing on soil defined as first class, and take Feistmantel's sixth sub-class of silver firs, we find we have in the 120th year a mass of wood, inclusive of faggots, of 9250 cub. ft. and an average increase of 77 cub. ft.; if we subtract 25 per cent. from this for faggot wood, there remain 6850 cub. ft. of timber in the 120th year, giving an increase of 57 cub. ft. per acre per year.

"Now a typical spruce trunk in an even-aged stand of 120 years is about 11 inches in diameter, while the selection-forest produces trees from 16 to 22 inches in diameter, so that the timber is of much greater value".

Hufnagl says further: "The selection system, which is pointed out as the most extensive method, really represents an individual tree management. This is well known to be our most intensive method". He concludes his observations with the following words: "Where different conditions of stands already exist these should be retained, no attention being paid to this or that prevailing fashion in forestry; for only extensive local experience should or can be the foundation of changes in methods of cultivation. Hours of calculation cannot prove what can be demonstrated in one minute by the callipers and the increment borer."

From the preceding observations we therefore conclude that the selection forest owes its great powers of increase, not to its favourable position, but rather to the careful management of the trees, and the consequent improvement of the soil. If we were to make a clear cut of such a forest, the reserve treasures of the soil would be dissipated in a few years, either by leaching or by the growth of weeds; the weathering of the mineral subsoil would be interrupted, and, under these circumstances, there could be no question of reafforestation.

There is a splendid selection-forest of spruces in the Royal Forest of Panaveggio (South Tyrol), which has been described in glowing terms by all who have visited it. Wessely describes it as follows: "The Panaveggio timber is renowned for its excellence as far as Verona and Venice. It is distinguished by its unusual thickness, its narrow annual rings and freedom from branches, as well as by extreme durability. This well-managed selection-forest is an almost closed high forest, and only differs from ordinary old stands of even-aged trees in the fact that its trunks are not so equal in diameter and that some poles, as well as occasional saplings, occur between the older trees".

In this forest, standing at 1600 to 1800 m. (5000 to 6000 ft.) clear felling would be entirely out of place, all the more so that different stand conditions are already in existence, and according to Hufnagl these ought to be maintained.

For our high mountains the selection system is of incalculable advantage and is often the only possible method. Those who regard it as an antiquated system excluding all idea of progress have no conception of the difficulties attending high mountain forestry.

In a work published in 1911 and entitled "Die intensive Bewirtschaftung der Hochgebirgsforste" (The Intensive Management of Mountain Forests), I have (on page 33) spoken against a too long rotation in the case of woods on steep slopes treated according to the selection system; I maintained that the rotation period in such cases should correspond with the shortest period necessary for the trees to reach maturity and to acquire utilisable dimensions, because in this manner natural regeneration takes place readily and as the trees are not so large as they become when older, their removal is easier and damage due to felling can better be avoided.

In explanation I should here like to mention that I did not wish to say anything against the selection-forest, but in making these remarks I had in my mind the fact that stands on steep slopes treated according to the selection method, are usually composed of trees of the same age and are often very old; hence careful management is necessary and proper transport arrangements are indispensable.

We have now reached the most necessary condition for the practice of the selection system, *viz.* the opening up of the several forest districts by establishing well-planned transport stations.

In my above-mentioned work I said in this connection: "It has been shown to be an absolute necessity to open up our high mountain selection forests by means of flumes, timber tracks, etc., which will connect with the chief transport stations, and also to make the rotation period as short as possible; only thus shall we obtain a good supply of utilizable timber from such forests and ensure natural regeneration".

This condition applies not only to the high mountains, but also to the lower mountains and the hills, and where it is not fulfilled the careful forestry required by the selection-forest is not possible.

Unfortunately, as a rule the actual circumstances are very different. There are no transport stations in the mountain forests treated on the selection system. The timber is conveyed to the valley in the most primitive manner, usually by means of badly constructed earth slides, often even down precipices. In these forest areas, the selection is generally limited to the removal of dead and harmful trees, while in many instances such stands are completely left to themselves.

In the lower mountains and hills similar conditions, though perhaps not quite so unfavourable, prevail. The selection-forest is not regarded as a true commercial forest; it receives scant attention and the provision of good, adequate transport stations is considered unnecessary, probably from the idea that the yield of such a forest is small in itself and does not justify even a small outlay for opening it up.

With regard to wood transport and its cost, the selection-forest is always at a disadvantage when compared with clear felling, *i. e.* the expenses of transport are under all circumstances heavier. Even if it is arranged that longer intervals, say 20 years, shall be left between each felling, so that the supply of wood shall be fairly large, still the disadvantage remains that the same amount of timber which occupies one acre in the clear felling, is scattered over 5 to 10 acres in the selection-forest.

Marking trees for felling in the latter is difficult, and takes much time. Even with the greatest care, injuries due to felling cannot be avoided.

These are briefly the chief reasons of the objection to the selection system.

In addition, the foresters of the present day, whether in the service of the State or of private individuals, are overwhelmed with secretarial work to which they devote all their spare time. Too little time thus remains for forest management, or the solution of questions of pure forestry. In the Austrian Forest Service marking trees for felling is one of the most important duties of the Forest Superintendent. In the instruction of the Staff of Management of the Imperial Forests and Domains, special stress is rightly laid upon this duty. Where the forester is overwhelmed with secretarial work it is but natural that he should prefer the system which requires of him the least expenditure of time, and this is clear felling. The arrangements for management, also, are not favourable to the selection-forest. The estimation of the yield of the selection-forest presents too great difficulties, although owing to the work of Hufnagl, Tichy and other experts, the methods to be observed seem to have been clearly and indubitably set forth. The mass and yield of an even-aged forest are much more easily calculated, and as all managers work more or less according to one or other scheme, and have usually very large tasks to accomplish, they naturally from their point of view prefer those systems of forestry which are based on stands of the same age, and certainly by preference on clear felling with subsequent artificial regeneration. Here, no doubt can arise as to the mass and increase of the stands, the stand charts give a clear picture of the age of the different stands, and estimates of the capability are quickly and easily made.

It is the calculators of net returns who least approve of the selection-forest, because it is absolutely impossible to strain it into mathematical figures. Their calculations break down when applied to woods containing trees of different ages, but especially in the case of the selection- forest, for factors creep in whose importance cannot be estimated.

It should therefore cause us no surprise if the selection-forest finds so few advocates amongst the foresters of the present day. It is the system which makes the greatest demands upon the forester, provides him with difficult questions to settle and is a complete failure if practised superficially and with insufficient insight.

But in spite of all opposition, the introduction or retention of the selection system is undoubtedly to be recommended where it is a question of the uninterrupted maintenance of a high crop, as in the cases of protection forests under servitude, small areas supplying forest dwellers with wood, or peasants' forests which supply the domestic needs of their owners.

It is in Switzerland that selection-forests are most prized; here the importance of this system from the standpoint of rural economy is recognized and fully appreciated. Quite independently of the important part played by the selection system in the case of protection forests, it is the high yields of the very well managed selection-forest which have won for it enthusiastic supporters, especially the Forestry Inspector of the Confederation, Dr. Fankhauser.

I have myself visited some of the Swiss selection-forests, notably those in the Canton Graubunden, and was delighted with their beauty and the care with which they are managed. Excellent transport stations also are not wanting; as a rule these are used for alpine economy, as well as for wood transport.

In this connection we should do well to take Switzerland as our model.

Results of Drilling Manures in Hungary

by

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Until recently in Hungary chemical manures were generally spread by hand or by machines which distributed them very evenly over the surface of the soil; but the experiments made during the last ten years have shown that in Hungary, especially in the dry regions (first among which is the great Alföld plain) articial manures, with the exception of nitrate of soda, are more certain in their action if they are applied before sowing and at the same time buried to a depth of 5 to 6 inches.

Consequently, in 1909, when the distributor Record II, made at Losoncz in Hungary, was adopted for drilling the manures and seeds together, it was natural that it should have been looked upon with distrust by farmers as being contrary to their fundamental principles of manuring. For this machine deposits the manure and seed together in the same drill, on the principle that more fertilising material is readily available to the delicate seedlings and promotes their rapid and vigorous growth. Unlike other distributors it does not deposit the manure first and then the seed, but possessing only one tube it supplies both at the same time to each coulter and is consequently of simpler construction and of much easier draught than machines with separate tubes and coulters for the seed and manure. In fact, except for the weight of the manure box (built on Schlöer's system), it is not heavier than an ordinary seed drill, a point of considerable practical importance. Considering the following results of experiments, there is no reason to believe that manure so applied has any effect on the germinating power of the seeds, and no doubt remains as to the efficiency of the method.

Two great advantages of this method are: that one-half of the quantity of manure is enough to secure remunerative results, and the cost of working is considerably reduced, as the machine Record II performs at the same time the two operations of manuring and seeding. These economies themselves are sufficient to rouse the interest of Hungarian farmers, and experiments carried out to determine how far these advantages can be realised are summarised in this article. They were commenced in 1909 and were carried out on land in various parts of Hungary and continued during successive years of varied character; the above-mentioned machine was almost es clusively used. The results given below have been collected from those published in the various agricultural journals of Hungary. They are divided into three groups as follows:

1). Effect of manures in drills compared with unmanured plots.

2). Manure in drills compared with manure broadcasted.

3). Distribution of manures other than superphosphate, particularly nitrate of soda and 40 per cent. potash.

The general poverty of Hungarian soils in phosphoric acid (owing to the extended cultivation of cereals) favours a greater response to applications of superphosphate; though there is frequently a need for nitrogenous and potash manures, phosphatic manures are most commonly in use throughout the country. This fact, along with the introduction of this distributor has done much in determining the value of drilling manures.

EXPERIMENTS WITH WINTER CEREALS.

The results are summarised in Tables I, II and III.

TABLE I. — *Wheat.*

Year	County	Soil	Quantity of superphosphate applied per acre		Increase in yield over control plots, per acre		Value of increase after deducting cost of manure, per acre	
			in drills	broadcasted	in drills	broadcasted	in drills	broadcasted
			lbs.	lbs.	lbs.	lbs.	£ *s* *d*	£ *s* *d*
1909-10	Pest, Pozsony and Nograd (3 estates)	clay humic clay	124-139	—	202-744	—	0 11 10 to 2 16 1	—
1910-11	Komárom, Pest and Alsófehér (5 estates)	clay . .	109-117	—	434-496	—	1 12 1 to 1 17 6	—
		sandy humus . .	124-139	—	434-511	—		
1911-12	Komárom and Alsófehér (3 estates)	clay . . sandy humus . .	124-139	—	234-248	—	0 12 10 to 0 14 1	—
1911-12	Nográd, Fejer, Pest, Szatmar, Arad Aranyos-Torda (8 estates)	clay . .	124 *	240 *	509	383	1 18 2	1 3 5

* Cost of manure — in drills 4*s* 2*d*; broadcast, 8*s* 4*d*. The figures in this line represent averages.

TABLE II. — *Rye.*

Year	County	Soil	Quantity of superphosphate applied		Increase in yield over control plots		Value of increase after deducting cost of manure	
			in drills	broad-casted	in drills	broad-casted	in drills	broad-casted
			lbs.	lbs.	lbs.	lbs.	£ *s* *d*	£ *s* *d*
1909-10	Nogràd, Fehér and Györ (3 estates)	clay	124-139	—	357-387	—	1 2 9 to 1 4 1	—
1910-11	Komárom and Fejér (3 estates)	sand	124	—	248	—	13 6	—
		clay	124	—	690	—	2 8 2	—
1911-12	Nográd, Fejér Zemplén Szatmár (5 estates)	clay loam	167	244	351	221	1 0 10	0 8 4

N. B. — The results of 1910-11 and 1911-12 represent averages.

These results show that with winter cereals, superphosphate applied in drills has given large increases in yield over the broadcasted as well as over the unmanured plots, and that a small quantity of manure drilled in with the seed can produce as good or even better yields than a large quantity broadcasted. In several cases shown in Table III only half the quantity of manure applied in drills was required to produce equally and even slightly more paying results.

TABLE III.

District	Soil	Quantity of superphosphate applied, per acre		Increase in yield over control plots, per acre	
		in drills	broadcasted	in drills	broadcasted
		lbs.	lbs.	lbs.	lbs.
I. - *Winter Wheat.*					
Nográd.	Clay	93	186	497	465
Fejér.	Humic-clay	116	232	744	713
Arad.	Clay	155	310	439	399
II. - *Winter Rye.*					
Györ.	Clay	101	202	694	740

In other cases the best results were obtained by drilling quantities of superphosphate exceeding half the dressing broadcasted.

EXPERIMENTS WITH SPRING CEREALS.

These experiments were conducted with two-rowed brewing barley and oats. Experiments in Hungary have shown that in manuring spring cereals having a short vegetative period, it is necessary to apply the manures well in advance of the sowing to obtain their full effect. It was therefore to be expected that drilling the manures with the seed would give a negative result.

1. *Two-rowed spring barley.* — The results of 1909 were obtained in one district only, a clay soil in the county of Nograd. They are summarized in Table IV.

TABLE IV.

Manure				Increase over control plots	
292	lbs.	Superphosphate	broadcasted	544	lbs.
101	»	»	drilled.	653	»
147	»	»	»	653	»
194	»	»	»	601	»

In 1910, three estates (counties of Nográd, Pozsony and Pest) manured with 124 to 155 lbs. of superphosphate applied in drills gave an increased yield of 202 to 263 lbs. on loamy soil, and 496 to 883 lbs. on a humic clay soil, making a net profit of 8*s* 4*d* to 11*s* 6*d* and £1 7*s* 7*d* to £2 13*s* 11*d* respectively.

In 1911 experiments were carried out on eleven estates to compare the yields of unmanured plots with plots manured in drills, and drilling with broadcasting the manure. In two estates (in Komárom) on sandy humus, 124 lbs. of superphosphate applied in drills increased the yield of grain by 216 lbs., and in another district (Kisküküllö) on a sandy soil, 155 lbs. of superphosphate gave an increase of 635 lbs., or a net profit of from 9*s* 11*d* to £1 13*s* 11*d*.

Table V shows the average increases obtained on 7 estates (Nográd, Kolozs, Nagyküküllö and Aranyos-Torda counties) on loam and humic clay soils.

TABLE V.

Manure				Increase in yield of grain over control plots			
202 to 232	lbs.	Superphosphate	broadcasted	124	to	611	lbs.
78	»	»	drilled	233	»	326	»
116	»	»	drilled	210	»	528	»
155	»	»	»	410	»	736	»

The results obtained on two estates have provided interesting comparisons of the influence of cultivation and seed time on the increase in yield produced by applying chemical manures broadcast and in drills.

The increases in the yield of barley over the control plots, sown at the end of April after spring cultivation, are as follows :

	Increase
232 lbs. of superphosphaie broadcasted . . .	145 lbs.
116 » » » drilled	456 »

Barley sown in the middle of March after autumn cultivation and harrowing in the spring gave the following increases :

	Increase	Value
232 lbs. of superphosphate broadcasted	611 lbs.	£1 12*s* 8*d*
116 » » drilled	582 »	£1 9*s* 10*d*
155 » » »	738 »	£2 4*s* 10*d*

These results show that artificials broadcasted, and still more those drilled, exerted a greater influence on barley sown at the beginning of spring on soil ploughed in the autumn. In 1912, on four estates (counties of Komárom, Sáros and Aranyos-Torda) on clay and humic clay soils, the following results were obtained :.

	Increase	Value
232 lbs. of superphosphate broadcasted	294 lbs.	11*s* 2*d*
116 » » » drilled	238 to 651 lbs.	11*s* 7*d* to £1 19*s* 1*d*

2. *Oats.* — Experiments conducted on ten estates have given the same results as those obtained with barley. Applications of 93, 116 and 124 lbs. of superphosphate in drills have produced greater increases than broadcasting 186 and 232 lbs. In this case also the time of cultivation of the soil and of sowing have considerable influence on the action of the manure applied in drills. Oats sown late (at the end of April) after spring cultivation gave the following increases :

	Increase
93 lbs. of superphosphate in drills	115 lbs.
116 » » » »	112 »

Whilst oats sown early (in the middle of March) after autumn cultivation gave the following :

	Increase
98 lbs. of superphosphate in drills	181 lbs.
116 » » » »	183 »

3. *Spring wheat.* — Comparative experiments were made only in 1911 on three estates (Kolozs and Szolnok-Doboka counties) on clay soil, with the following results :

	Increase
116 lbs. of superphosphate in drills	191 to 208 lbs.
170 » » » »	574 »
232 » » » broadcasted	62 to 232 »

These results also show that in drilling manure, half the quantity usually broadcasted is not sufficient, and that the best results are obtained by applying a larger quantity than this, namely 170 lbs.

The results of these experiments made between 1909 and 1912 may be summarised as follows.

1. Superphosphate applied in the drills with the seed has no corrosive or injurious action on the germinating power of the seeds in either dry (1911) or wet seasons (1912). Even quantities as large as 232 lbs. have no injurious action on germination. In fact the germination of the seeds sown with manure is more rapid and uniform.

The corrosive action of superphosphate when drilled in, and the decrease of germination and lower yield, were only observed when the pickled seeds were not sufficiently dried before sowing. Some experiments on barley and oats with mixtures of nitrate of soda and superphosphate have shown that even with doses of 93 lbs. of nitrate and in direct contact with the seed, germination was not at all impaired.

2. The majority of experiments have shown that manuring in the drills is more profitable than broadcasting, because of the economy of the manure. As a rule half the usual quantity of manure sown in this way is sufficient; there are exceptions and it is necessary to determine the correct quantity for each estate by comparative experiments.

Manuring in the drill, however, does not produce better results in the second year, but this is of little consequence, since it is in the best interests of the farmer to obtain his maximum yields in the first year, and it is not difficult to repeat the application each year, especially with small quantities, all the more so as it does not cost extra labour, for the same machine drills seed and manure together.

3. This method of manuring also gives considerable increases in the yield of straw, which is a distinct advantage with the straw of spring cereals (barley and oats) which is used as fodder.

4. In the dry season of 1911 the superiority of drilling in the superphosphate with the seed was particularly evident and there appeared to be sufficient moisture both for the germination of the grain and the decomposition of the manure.

5. Whenever no result was obtained by drilling the manure none was obtained by broadcasting it and every experiment successful with broadcasting was also successful with drilling the manure. Four years' experiments under the most varied conditions of soil and climate have shown that a soil particularly responsive to dressings of superphosphate responds most when it is applied in drills.

6. Manuring in drills has also in most cases a beneficial effect on the quality of the grain, *i. e.* the weight per bushel.

EXPERIMENTS ON SUGAR-BEETS.

The best results have been obtained in these experiments. In many cases sugar beets do not respond at all to artificial manures broadcasted, but a small quantity drilled in with the seed is very effective. The manure being readily available to the seedling, enables it to grow out of the dangerous period quickly and become established with greater vigour than with broadcasted manure.

This was evident in the experiments of 1909-12 and farmers are unanimously agreed that sugar-beets manured in the drill germinate more quickly and uniformly and that their subsequent growth is more vigorous and resistant to drought than when they are manured broadcast.

The results in Table VI were obtained on six estates (Pozsony, Nyitra, Nográd and Csanád counties) on clay and humic clay soils.

TABLE VI.

Quantities of superphosphate	Increase in yield	Value of increase
302 lbs. broadcasted	775 to 4495 lbs.	— 1*s* 7*d* to 17*s* 8*d*
93 to 108 » drilled	3100 » 4495 »	19*s* 10*d* » £1 14*s*
155 » »	5425 » 6200 »	£1 19*s* 9*d* » £2 6*s* 2*d*

The following are the results obtained by using a mixture of superphosphate and nitrate of soda.

Manures	Increase in yield	Value of increase
116 lbs. of superphosphate + 46 lbs. of nitrate of soda in drills	9145 lbs.	£3 6*s* 9*d*
232 » » + 93 » » » broadcasted	3875 »	18*s* 3*d*

The injurious effects of nitrate of soda on germination were only noticeable when it was applied in larger quantities than 93 lbs., in which case it prevented uniform germination and diminished the yield.

In the county of Csanád on a humic clay soil it was found that the addition of 78 lbs. of 40 per cent. potash to the mixture of superphosphate and nitrate of soda produced when drilled a quicker and more uniform germination than when the potash manure was broadcasted, and that moderate applications of potash did not have an injurious effect on the germination of the grain when drilled with it.

Manuring in the drill does not decrease the proportion of sugar in the beets, but on the contrary in some cases it increases it. Similar results have also been obtained with mangels. The seedlings of both plants are more resistant to root disease ("Pied noir" or "Wurzelbrand") when manured in this way.

The undoubted success of these experiments both in the dry season of 1911 and in the wet year 1912 makes it very probabe that this system of manuring in the drill will be generally adopted in agricultural practice.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1230 - **Law of July 2, 1913, Encouraging the Replanting and Preservation of Private Forests in France.** — *Journal officiel de la République française,* Year 45, No. 181, pp. 5809-5810, and No. 274, p. 8911. Paris, July 6 and October 9, 1913.

Art. 1. — The undermentioned lands are to be administered by the Forest Office according to the provisions of the Code relating to woods belonging to public bodies:

1) Woods and forest belonging to Departments.

2) All forests, woods and lands reserved for planting belonging to recognized societies of public utility and approved mutual aid societies.

Art 2. — The second paragraph of article 11 of the law of July 1, 1901, concerning deeds of partnership to be terminated as follows:

" Woods, forests and land to be planted may be acquired, either by purchase or gratuitiously ".

Art. 3. — The Forestry Administration is empowered to take charge, either wholly or in part, of the preservation and management of woods belonging to persons or societies, in consideration of an annual payment according to the terms of agreement, which shall be made for a period of not less than ten years. Applications to be made to the Conservator of Waters and Forests in the district in which the property is situated.

The provisions of articles 91, 97, 107 (§ 2), 108 and 109 (§1), relating to woods belonging to public bodies, those of section 1 of chapter XI, with the exception of paragraph 2 of article 169, those of paragraph 2 of article 189, and those of section 1 of chapter XIII, to be applied to these woods.

All agreements and sales not authorised by the forest administration or not conforming to their conditions, effected by the proprietors or administrators of these woods who have allowed to third parties rights of use, or have proceeded to cut timber, are declared null and void.

Art. 4. — A sum equivalent to the anticipated income of the fees of administration paid by recognized societies of public utility, approved mutual aid societies, and by individuals and other societies, to be placed at the disposal of the Forestry Administration in payment of the supplementary expenses of administration.

Art. 5. — All acquisition of woods, forests and lands to be planted will be worked according to the provisions of article 10 of the law of July 20, 1895, and will be included in investments effected by means of the local savings bank, provided that the total acquisitions shall not exceed one-tenth of the personal capital.

Art. 6. — The conditions of working of the present law will be determined by an order of public administration.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

1231 - **The Agricultural and Forestry Colleges and Schools in Austria in the Scholastic Year 1912-13.** — *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 55-107. Vienna, 1913.

The number of Agricultural and Forestry Colleges and Schools in Austria during the scholastic 1912-1913 amounted, including the Brewing and Distillery Schools, to 226. The new colleges and schools opened since the previous year included the Agricultural School (Mittelschule) at Kloster-Hradisch, 5 Agricultural Winter Schools, 2 Housekeeping Schools, the Winter Agricultural and Horticultural School at Schnobolin (Moravia), and the Fruit-growing School at Wisowitz (Moravia).

The following Schools have been closed: the School of Agriculture and Hop-growing at Kloster-Hradisch, two Winter Schools, one Housekeeping School and the Brewing School at Mödling.

The 226 schools include: 3 Colleges or divisions of Colleges, 3 Agricultural and 1 Brewing Academy, 9 Agricultural and 5 Forestry Middle Schools, 2 Technical Middle Schools for Vine and Fruit-growing and Horticulture, 42 Agricultural Schools, *i. e.* Lower Agricultural Schools with instruction throughout the year, 91 Agricultural Winter Schools (19 of these also hold a summer housekeeping course), 11 Lower Grade Forestry Schools, 4 Dairy Schools, 22 Housekeeping and Farm Schools, 30 Lower Grade Special Schools for horticulture, the cultivation of fruit, vines, vegetables, flax and hops, for the cultivation of meadows and for Alpine farming and beekeeping, 1 Brewing and 2 Distillery Schools. The accompanying table gives the details respecting the number of students and teachers, and of the length of the courses in the single schools or groups of schools during the scholastic year 1912-13.

Colleges and Schools	Length of Course	No. of the Regular Staff	No. of Outside Teachers	Actual number of students in the beginning of March 1913
I. — *Colleges.*				
Royal Imperial Agricultural College in Vienna	4 years	63	26	1 159
Agricultural Section of the Cracow University	4 »	8	14	296
Agricultural Section of the Bohemian Technical College at Prague.	4 »	21	18	176
II. — *Agricultural Academies.*				
Tabor (Bohemia)	2 »	10	8	146
Tetschen-Liebwerd (Bohemia)	2 »	27	2	64
Dublany (Galicia)	3 »	15	9	132
Brewing Academy in Vienna	2 »	4	19	17
III. — *Agricultural Middle Schools.*				
Agricultural at:				
Mödling	3 »	6	8	119
Chrudim	3 »	14	5	212
Kaaden	3 »	12	8	220
Raudnitz a. E.	3 »	14	4	227
Kloster-Hradisch.	2 »	6	1	61
Neutitschein	3 »	6	5	88
Prerau	3 »	9	4	123
Ober-Hermsdorf	3 »	9	4	55
Czernichów	3 »	10	4	62
Forestry at:				
Bruck a. d. Mur.	3 »	5	5	43
Pisek	2 »	9	5	77
Reichstadt	3 »	8	1	93
Mährisch Weisskirchen	3 »	8	3	79
Lemberg	3 »	7	9	83
Higher School for Vine and Fruit-growing at Klosterneuburg	3 »	7	11	49
Higher Fruit-growing and Horticultural School at Eisgrub	3 »	4	6	58
IV. — *Lower Schools.*				
42 Agricultural Schools (1 for women) . .	2–3 »	175	194	1 508
91 Agricultural Winter Schools	1–2 »	251	610	3 370
11 Forestry and Woodcraft Schools. . . .	1–2 »	26	39	392
4 Dairy Schools	1 (one 2) »	19	9	52
22 Housekeeping and Farming Schools . .	1–2 years	100	63	630
30 Special Schools for Gardening, the Cultivation of Fruit, Vines, Vegetables, Flax, Hops, Meadows, and for Alpine Farming and Bee-keeping.	1–3 »	91	90	816
3 Brewing and Distilling Schools. . . .	1 year	8	18	84

1232 - **Schemes for the Reform of Horticultural Education in Austria.** — SCHECHNER, KURT in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 34-41. Vienna. 1913.

The Imperial and Royal Horticultural Association of Vienna intends to carry out a thorough reform of the system of horticultural education. The aims of the Society and the direction of their efforts are set forth in this article by its Secretary General.

According to this scheme, the first step will be the establishment of apprentice-schools, of which four are already founded. These are schools consisting of two classes in which instruction is given for nine hours weekly during the six winter months. The curriculum includes: 1) Technical and commercial instruction (the solution of commercial problems, arithmetic, book-keeping); 2) Civil law; 3) Drawing; 4) Horticulture (gardening, fruit-growing, land measurement, plant diseases, natural history, seed growing; 5) Instruction in general subjects.

The gardener must look to the under-gardeners' schools for the continuance of his education. These also consist of two classes. Admission is granted on the production of a leaving certificate from the apprentice-school, or of a certificate showing that the candidate has completed the course of instruction. In these schools instruction is given in 18 hours of lessons a week during the six winter months. The curriculum includes: the German language, geography and civil law, arithmetic and geometry, chemistry, mineralogy and zoology, book-keeping and correspondence, botany and seed-growing, gardening, fruit-growing, plant diseases, landscape gardening, garden history, field measuring and management.

The writer considers that the travelling grant given to young students on leaving the apprentice-school is an important educational factor. By this means they are enabled to travel and also to work abroad. Opportunity should also be afforded from time to time to the educated, practical gardener to become acquainted wih the results of the latest investigations and researches. This is effected by the " gardening weeks " and gardening courses. The " First Austrian Gardening Week " was held in Vienna from the 9th to the 14th of December 1912. The great interest shown in gardening circles has induced the Council of the Imperial and Royal Horticultural Association to make this gardening week into a permanent institution in the capitals of the different States of the Empire.

In the opinion of the writer, the foundation of half-yearly winter schools (with whole day attendance) would offer a second opportunity to young gardeners for the prosecution of their studies. These, however, would only be established in gardening centres where special crops are cultivated.

Landscape gardeners and head-gardeners receive suitable instruction in Horticultural Colleges (" höhere Gartenbauschule "). As the necessary entrance certificate of one year's practical work by no means ensures that the candidate possesses the required practical experience, the writer thinks it would be advisable that the curriculum of the gardening school should include a year's practical preliminary course, and that the instruction given during the last years should be specialized. It would also be very advantageous if a large market garden were attached to such a school where the student could also be instructed in the commercial side of gardening. In the case of the landscape gardeners, it is very useful and even necessary that they should have the opportunity of completing their education by attending a one year's course at the School of Applied Arts. An interval of two years should elapse between leaving the Horticultural College and entering this School.

1233 – **Importance, Scope and Carrying out of Practical Work in Agricultural Schools.** — 1) SCHNEIDER, FRITZ; 2) GROSS, ALOIS; 3) MARESCH, HEINRICH in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part 1-2, pp. 18-33. Vienna, 1913.

The writers deal with the following points:

1. *Practical training in middle agricultural schools.* — *a*) Necessity of practical knowledge for pupils leaving these schools; *b*) advantages and necessity of a preparation on practical lines before admission; *c*) scope and carrying out of practical work in the middle agricultural school at Neutitschein in the three years' course.

2. *Practical training in farm schools.* — *a*) Advantages and necessity of having a farm attached to the school; *b*) scope and carrying out of practical work at the school of agriculture and flax-growing at Mährisch-Schönberg in summer (field work, cultivation and preparation of flax, animal husbandry, dairying, fruit and vegetable growing, forestry) and during the winter (manual work, including wheelwright's work, saddlery and basket work).

3. *Practical work in winter agricultural schools.* — *a*) Manual, including basket work, woodwork and saddlery; *b*) practical work in the school garden and experimental fields.

1234 – **Proposals for the Unification of the System of Instruction in the Lower Agricultural Schools in Austria.** — JACHIMOWICZ, FRANZ in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 42-54. Vienna, 1913.

The writer complains of the inefficiency and the disadvantages of the existing system of dividing the Agricultural Schools into one-year schools, two-year schools, and winter schools, and proposes that all these different educational establishments should be transformed, according to a single system, into schools with three half-years with an optional (practical) summer half-year, and occasional practical spring and summer courses. He further treats of the division among the teachers of different subjects, the distribution of the subjects over the three half-years and the methods of instruction and examination to be adopted.

1235 – **Agricultural and Forestry Colleges in Prussia during the Summer Half-year of 1913.** — *Zentralblatt der Preussischen Landwirtschafts-Kammern*, Year 12, No. 36, p. 241. Berlin, September 8, 1913.

The agricultural colleges of Prussia were attended during the summer half-year of 1913 by 963 students, of whom 622 continued from preceding half-years. The new students entered were 171 and there were 170 unmatriculated ones.

At the Berlin Agricultural College the students were 500 (78 newly entered and 155 unmatriculated), while the agricultural academy of Bonn-

Poppelsdorf had altogether 493 students (93 newly entered and 15 unmatriculated). As agricultural students, the total entered was 511 (233 at Berlin and 278 at Bonn); 308 were entered as land surveyors and rural engineers (Geodäten und Kulturtechniker), namely 129 at Berlin and 179 at Bonn. In the agricultural technical section (fermentation industries) there were 79 students at Berlin. The lectures at the Berlin college were attended also by 252 students from the Veterinary College, and 113 students from Berlin University followed the common courses of the Agricultural College and of the University.

The Veterinary Colleges were attended by a total of 749 students, of whom 397 entered at the Berlin Veterinary College and 352 at the Hanover Veterinary College. In the first-named there were 310 students from preceding half years, 72 were new and 15 were unmatriculated. In Hanover the corresponding figures were 262, 83 and 7.

The two Forestry Colleges have between them 138 students, namely 60 at Eberswald and 78 at Münden. Of the former 67 are from the preceding courses and 3 newly entered, while the latter has 64 old students, 12 newly entered and 2 unmatriculated.

1236 - **Farm-Management Course at the Agricultural Academy of Bonn-Poppelsdorf.** — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 36; p. 243. Berlin, September 8, 1913.

The agricultural academy of Bonn-Poppelsdorf is starting a course in farm management and cooperation in the winter half-year 1913-14; it covers two halves and leads up to a special examination. It is designed to enable students to acquire a more thorough knowledge of social economy, law and administration, and the theory of cooperation and assurance, as applied to agriculture.

AGRICULTURAL SHOWS AND CONGRESSES

1237 - **Agricultural Shows.**

Argentine Republic.

1913-1914. Dec. 15 - April 15, Córdoba. — Show of fruit and objects connected therewith, bee-keeping, silkworm-rearing and vegetable fibres. Address to the president of the « Comisión organizadora », calle Independencia No. 159, Departamento de Agricultura y Ganderia de la Provincia de Córdoba.

Australia: New South Wales.

1914. The following shows will be held:

Jan. 29-31. — Wollongong Agricultural, Horticultural and Industrial Association. — W. J. Cochrane, Sec.
Feb. 4-5. — Berry Agr. Assoc. — S. G. Banfield, Sec.
Feb. 10-11. — Dorrigo Agr., Hort. and Ind. Soc. — W. R. Colwell, Sec.
Feb. 11-12. — Moruya Agr. and Pastoral Soc. — H. P. Jeffery, Sec.
Feb. 11-12. — Alstonville Agr. Soc. — C. D. Mc Intyre, Sec.
Feb. 17-19. — Guyra Pastoral, Agr. and Hort. Soc. — P. N. Stevenson, Sec.
Feb. 18-19. — Gunning Pastoral, Hort. and Ind. Soc. — J. R. Turner, Sec.
Feb. 24-25. — Dapto Agr. and Hort. Soc. — J. H. Lindsay, Sec.
Feb. 25-27. — Inverell Pastoral and Agr. Assoc. — J. Mc Ilveen, Sec.
March 3-5. — Uralla Agr. Assoc. — H. W. Vincent, Sec.
March 3-5. — Tenterfield Pastoral, Agr. and M. Soc. — F. W. Hoskin, Sec.
March 4-5. — Tumut Agr. and Pastoral Assoc. — T. E. Wilkinson, Sec.

March 5-6. — Oberon Agr., Hort. and Pastoral Assoc. — M. J. Looby, Sec.
March 11-12. — Coramba District Pastoral, Agr. and Hort. Soc. — H. E. Hindmarsh, Sec.
March 11-13. — Tumbarumba and Upper Murray Pastoral and Agr. Assoc. — E. W Figures, Sec.
March 17-18. — Gundagai Pastoral and Agr. Soc. — A. Elworthy, Sec.
March 17-19. — Bangalow Agr. and Ind. Soc. — W. H. Reading, Sec.
March 18-19. — Cobargo Agr., Pastoral and Hort. Soc. — T. Kennelly, Sec.
March 18-20. — Camden Agr., Hort. and Ind. Soc. — C. A. Thompson, Sec.
March 19-21. — Goulburn Agr., Pastoral and Hort. Soc. — G. G. Harris, Sec.
March 24-26. — Mudgee Agr., Pastoral, Hort. and Ind. Assoc. — P. J. Griffin, Sec.
March 24-26. — Narrabri Pastoral, Agr. and Hort. Soc. — D. J. Bridge, Sec.
March 25-26. — Blayney Agr. and Pastoral Assoc. — H. R. Woolley, Sec.
March 25-27. — Macleay Agr., Hort. and Ind. Assoc. — E. Weeks, Sec.
March 26-27. — Crookwell Agr., Hort. and Pastoral Assoc. — H. P. Levy, Sec.
March 31 - April 1. — Luddenham Agr. and Hort. Soc. — F. C. Emery, Sec.
April 1-2. — Cooma Pastoral and Hort. Assoc. — C. J. Walmsley, Sec.
April 22-24. — Bathurst Agr., Hort. and Pastoral Assoc. — J. Bain, Sec.
April 22-25. — Hunter River Agr. and Hort. Assoc., West Maitland. — E. H. Fountain, Sec.
April 28-30. — Tamworth Pastoral and Agr. Assoc. — J. R. Wood, Sec.
April 29 - May 1. — Orange Pastoral and Agr. Assoc. — W. J. I. Nancarrow, Sec.
May 6-8. — Clarence Pastoral and Agr. Soc., Grafton. — G. N. Small, Sec.
May 7-9. — Hawkesburry District Agr. Assoc., Windsor. — H. S. Johnston, Sec.
May 12-13. — Lower Clarence Agr. Soc., Mac Lean. — J. Mc Pherson, Sec.

Belgium.

1913. Dec. 13-15. Jemeppe-sur-Meuse (Liège). — See p. 1354, *B.* Sept. 1913.

1914. Jan. 17-19. Verviers (Liège). — Poultry show, organized by the "Société ornithologique de l'Est de la Belgique".

Feb. 21-24. Brussels. — International poultry show, organized by the "Société Royale des Aviculteurs Belges".

Cuba.

1914. Feb. 15-22. Havana, Quinta de los Molinos. — Poultry show, organized by the "Asociación de Avicultura Cubana".

France.

1913 Dec. Douai (Nord). — National poultry show, organized by the "Club des Aviculteurs et Eleveurs amateurs du Douaisis". Address to E. Mathieu, Gen. Sec., Roost-Warendin, Nord.

Dec. 10-15. Moulins (Allier). — International poultry show, organized by the "Société des Aviculteurs et Apiculteurs du Bourbonnais et du Centre". Address to M. Bruron, 36 rue de Bourgogne, Moulins, or to the general secretary of the society.

Dec. 17. Houdan (Seine-et-Oise). — Seventh show of live fat poultry and dead fat geese. Address to "Siège social du Houdan-Faverolles", 45 Grande-Rue, Houdan

Germany.

1914. Feb. 7-9. Leipzig. — Rabbit show organized by the "Allgemeine Kaninchen-Zucht-Verein für Leipzig und Umgebung."

Oct. 4-5. Hamburg. — Fourth fat stock show, organized by the Chamber of Agriculture of the Province of Schleswig-Holstein. It will include five sections: 1) Live stock (cattle, pigs, sheep); 2) carcases (competition); 3) stock fattened for definite purposes; 4) breeding stock belonging to exhibitors of fat stock; 5) objects and scientific matter concerning the production, trade and utilization of stock slaughtered. Address to the offices, Kampfstrasse 46, Hamburg.

Hungary

1913. Dec. 5-8. Budapest. — National poultry show organized by the National Society of Poultry Breeders.

Union of South Africa.

1914. Potchefstroom (Transvaal) and Middelburg (Cape). — Trials of tractor ploughs will be arranged by the South African Government.

Feb. 24. Graaf Reinet (Cape). — The Midland Agricultural Society will hold a tractor-ploughing competition in connection with its annual show.

March 6. Cradock (Cape). — Field trials for furrow ploughs, organized by the Cradock Agricultural Society. George H. Brynes, Sec.

1238 - **Agricultural Congresses.**

Austria.

1913. Dec. 19-20. Vienna. — Fourth meeting and general assembly of the "Oesterreichische Obstbau- und Pomologen-Gesellschaft" (Austrian Fruitgrowers' Association).

United Kingdom.

1914. *Note*. — With reference to the third International Congress of Tropical Agriculture (see *B*. Sept. 1913, No. 1238), address to the Organizing Secretaries, Imperial Institute, London S. W.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1239 - **Comparative Researches upon the Cohesion of Different Kinds of Soils.** — PUCHNER, H. in *Internationale Mitteilungen für Bodenkunde*, Vol. III, Part 2-3, pp. 141-239 + figs. 2. Berlin, 1913.

Notwithstanding the importance of the cohesion of the soil for the various operations of tillage, and the researches of Schubler, Haberlandt, Hazard, Atterberg and the writer upon the subject, this property of the soil is the least known and the least investigated.

The writer is of opinion that the best criterium for valuing the cohesion of a soil is afforded by its resistance to crushing pressure, which hitherto had been erroneously thought by agrologists to be absolute. In order to determine this resistance, the writer considers the method proposed by him as the best. It consists in exerting the acquired pressure by means of a lever on cylinders prepared with the fine earth (less than 3 mm. according to Fadejeff) to be examined. These cylinders are 3 cm. high and 2 cm. in diameter. The breaking weight is given in grams. The writer insists upon the essential condition that the structure and composition of these cylinders be as uniform and homogeneous as possible, and of the absolutely cylindrical shape of the sample of earth during the tests.

In this manner the writer has determined the cohesion of 265 samples of soil taken in several parts of Bavaria at varying depths from 0 to 8 inches and from 20 to 40 and 48 inches.

In general, cohesion is found to vary very much; in most cases it is less in the surface layers than in the deeper ones. The following table gives an idea of the various degrees and limits of such variability, in which the several degrees of cohesion determined for the superficial layers or to a depth of about 2ft. 2 in. are grouped together.

Cases	Cohesion according to Puchner, in grams
22	over 20 000
30	10 000 to 20 000
57	5 000 » 10 000
63	2 000 » 5 000
34	500 » 2 000
59	0 » 500

From the comparative study of the other properties of the soils examined, the writer deduces the eventual influence of mechanical and physical structure, of chemical composition and of biological factors upon the cohesion of soils, reaching the following principal conclusions, taking into account the fact that the determinations of cohesion were made on perfectly dry material.

I. The cohesion of a soil, other conditions being equal, probably increases the less sand (from 0.25 to 3 mm.) is contained in the fine earth and the more uniformily the other parts (from less than 0.0015 to 0.25 mm.) are mixed together in equal proportions.

II. The cohesion of a soil may also vary not only according to the physical properties of its constituent parts, but also according to chemical and biological conditions.

As for the application of these results to practical work, the writer has pointed out that in stiff soils cohesion diminishes gradually with an increase of moisture, whilst with loose soils the reverse takes place, with this difference: that coarse-grained loose soils show cohesion only with a maximum of moisture, whilst in those possessing a fine texture cohesion increases with moisture up to a certain point and then diminishes. Consequently the cohesion indices obtained as above must be increased when they are low, and diminished when they are high, in order to get data for judging soils naturally moist.

The resistance of the soil at a given degree of moisture remains to be determined. The writer remarks that though the farmer is anxious to till the soil when it is easiest to work, that is, most frequently, when moderately moist, nevertheless a closer knowledge of the factors determining cohesion may lead to the discovery of other means of reducing the cohesion of a soil in medium conditions of moisture and thus rendering it easier to work.

1240 - **The Bacterial Activity of the Soil in Relation to some of its Physical Properties.** - 1. RAHN, O. (Agricultural Experiment Station, Eart Lansing, Michigan.) Die Bakterientätigkeit im Boden als Funktion von Korngrösse und Wassergehalt. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, II. Abt.*, Vol. 35, No. 17-19, pp. 429-465 + fig. 1. Jena, October 30, 1912. — 2. ID. (Bacteriological Laboratory of the University of Wisconsin). Die Bakterientätigkeit im Boden als Funktion der Nahrungskonzentration und der unlöslichen organischen Substanz. — *Ibid.*, Vol. 38, No. 19-20, pp. 484-494. Jena, August 9, 1913.

In order to determine the influence of the physical properties of the soil on bacterial activity pure cultures of *Bacillus mycoides* and other aerobic bacteria were grown in a mixture of quartz sand, peptone and water, and in a parallel series of mixtures containing cellulose. The production of ammonia was taken as the index of bacterial activity. For studying anaerobic bacteria comparative cultures of *Bacillus lactis acidi* were made in mixtures of milk and sand and their activity measured by the quantity of acid and by bacterial counts.

The conclusions vary according to the method of comparison adopted. Estimated in percentages of dry soil, as is custumary in soil bacteriology, it would appear that the bacteria develop more readily in sand moderately damp (20 to 25 per cent. water); but estimated in terms of the peptone solution, ammonification is more rapid in a medium containing only 10 per cent. of water. Thus the results vary considerably according to whether the proportion of peptone is calculated in terms of soil or solution in water. Since the agriculturist is concerned only with the quantity of available nutritive substances present in the soil, it is necessary to determine the intensity of bacterial activity by comparing cultures equal in quantity and strength of nutritive substances.

In culture of *B. mycoides* the exchange of oxygen is considerably greater and the growth of bacteria more rapid in sand cultures than in cultures prepared in tubes or flasks. The exchange of oxygen between the soil gases and the liquid depends upon the amount of oxygen present in the soil gases and the surface exposed to the air. The surface area per unit of liquid is in inverse proportion to the square of the diameter of the soil particles and to the amount of liquid in the soil. The amount of oxygen in the air of the soil depends upon the aeration, which is almost proportional to the square of the diameter of the particles. The rate of decomposition is proportional to the thinness of the film of moisture up to a certain limit, extremely attenuated films retarding decomposition. The optimum thickness of water films for *B. mycoides* is about 20 to 40 μ. This thickness was obtained by using sand of 1 mm. diameter with humidity of 10 per cent. In arable soils in which the diameter of the particles does net exceed 0.1 mm., a humidity of 50 per cent. is necessary in order to obtain the thickest film; so that aerobic bacteria will never find the best condition of growth in ordinary soils.

Provided that the concentration of the nutritive substance is constant, the end of the decomposition in the case of *B. mycoides* is always the same, since only the rate of decomposition is modified by the supply of oxygen. With other bacteria this limit varies considerably.

Anacrobic bacteria, such as *B. lactis acidi*, follow the same principles; that is to say their growth depends chiefly on the thickness of the film of water.

Lastly, the physical effect of undecomposed organic matter was obtained by adding filter paper or peaty matter. In fairly dry media or soils, cellulose causes a decrease in the formation of ammonia owing to the withdrawal of some of the available moisture. In moist sand cultures, on the contrary, the addition of cellulose increases ammonification, probably owing to the separation of the particles and the increase in aeration.

1241 – **The Reawakening of the Soil.** MUNTZ, A. and GAUDECHON, H. in *Annales de la Science Agronomique*, Year 30, No. 1, pp. 1-15. Paris, July 1913.

The sudden outburst of life in the soil which occurs at the end of the winter with the first rise of temperature is a well-marked phenomenon and the writers have already alluded to it as the " reawakening of the soil." It would naturally be expected that this process should be connected with an increased biological activity, of which the production of nitrates is one of the most palpable and characteristic effects; the writers had grounds for believing that the nitrifying organisms, at that period of the year, go through a phase of intense activity which declines after a short time, and is due not simply to the rise in temperature, but rather to a predilection for a definite period of the year, to a kind of racial habit; to investigate this question they undertook the following set of experiments.

In 1910, during the period from February to June samples of soil were taken at fornightly intervals, their nitrate content was determined, and they were seeded into pots of soil (sterilized at 100° C.) and of leaf mould (sterilized in an autoclave at 100 - 102° C. for 3 hrs.). The pots contained 1.1 kg. of soil, or 375 gms. of leaf mould, to which had been added 0.2 per cent. and 0.3 per cent. respectively of ammonium sulphate; after being inoculated with 20 gms. of the " active " soil, they were incubated at 23° C., and their moisture content was kept constant by the addition of sterilized water. Their contents were sampled once a fortnight and analysed for nitrates, and the inactivity of the uninoculated sterilized soil and leaf mould was checked by one pot of each material which received no " active " soil and in which the nitrate content was practically constant throughout the experiments. The samples of the " culture " soil were drawn from a piece of open ground covered over with a large tin basin to prevent washing by rain.

In 1911 a second series of experiments was carried out under similar conditions, except that the " active " soil samples were drawn from a block of soil of 7 kg., which was taken from the field in the early part of February and subsequently kept at a constant temperature of from 0° to 2° C.; and further that each time the pots were sampled, sufficient ammonium sulphate was added to bring their content up to 0.2 per cent. or 0.3 per cent. again as the case might be.

The data of the samples used and the results of the two seasons are shown in the accompanying tables.

"Active" soil samples.

1910			1911		
Date of sampling	Temp. of soil 4 in deep.	Nitrates: Nitrogen in mgm. per kg. of dry soil	Date of sampling	Temp. of soil.	Nitrates: Nitrogen in mgm. per kg. of dry soil.
Feb. 18	4°C	3.8	Feb. 14 . . .	0° — 2C	12
March. 3 . . .	5°C	6.0	» 28 . . .	»	12
» 18 . . .	7°C	6.2	March 14 . . .	»	15
April 2 . . .	12°C	6.2	» 28 . . .	»	14
» 18 . . .	9°C	6.2	April 11 . . .	»	15
May 2 . . .	10°C	12.5	» 25 . . .	»	13
» 17 . . .	16°C	12.0	May 9 . . .	»	22
June 6 . . .	20°C	12.5	» 23 . . .	»	17
» 13 . . .	16°C	12.0			

Soil or leaf mould from pots.

Date of Inoculation	Nitrates (as Nitrogen in mgm. per kg. dry soil) formed			
	In soil		In leaf mould	
	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation
1910.				
Feb. 8	9	40	129	—
March 3	158	249	236	—
» 18	300	294	381	—
April 2	108	333	416	—
» 18	208	191	454	—
May 2	206	141	125	—
» 17	—	—	58	—
1911.				
Feb. 14	144	128	129	1 052
» 28	64	251	355	959
March 14	50	420	707	1 820
» 28	291	243	1 704	234
April 11	406	196	701	353
» 25	388	92	454	315
May 9	265	179	270	1 242
» 23	253	325	1 019	937

In the soil the formation of nitrates is not so rapid as in the leaf mould, so that in the former medium the 3rd fortnight after inoculation forms the best period of comparison, while in the leaf mould nitrification is already sufficiently active during the 2nd fortnight. In both years and in both media there was demonstrated a period of maximum activity for the nitrifying organisms corresponding to the time when the so-called reawakening of the soil occurs in the district (Paris). The activity could not be attributed to variation in temperature, as the pots of soil and of leaf mould were all maintained at a constant temperature, and as during the second year this factor was also eliminated from the soil used for inoculation. The period of maximum activity was followed by a period of reduced nitrate formation which persisted a certain length of time, and though later the fermentation again increased, it never became as intense as during the first outburst in the early spring.

1242 - **Studies in Bacteriological Analysis of Indian Soils: No. 1, 1910-1911.** — HUTCHINSON, C. M. (Imperial Agricultural Bacteriologist, Pusa). — *Memoirs of the Department of Agriculture in India, Bacteriological Series*, Vol. I, No. 1, pp. 65, figs. 2, plates VI, diagr. II. Calcutta, November 1912.

The writer has made thorough preliminary investigations into the bacteriology of certain Indian soils. A large part of the present paper is occupied with a discussion of comparative experiments on the methods to be used in estimating the numbers of bacteria present and their activity, especially in the changes of nitrogen under various conditions.

In an investigation of the so-called " weathering " of soils by repeated ploughing in the hot dry season preceding the spring rains, it was found that the maximum temperature reached by the top quarter inch was 60° C. Artificial weathering was therefore effected by exposing soil to the heat and light of a Nernst lamp for 8 hours daily for a week at such a distance that the maximum temperature at the surface was 60° C. The results showed that the number of bacteria was considerably reduced and that all but the sporing forms of the *subtilis* group (*B. mycoides*, *B. subtilis*, *B. mesentericus*) were eliminated from the first inch of soil. It was found that the nitrifying power of the soil was not destroyed or altered by " weathering ", which the writer explains as due to reinfection of the surface soil from the lower layers.

The soils were further examined for the presence of protozoa by seeding into hay infusion ; two types of protozoa occurred (together in some cases) ; none were found between November and May. These two types were destroyed at 60° C. but not at 55° C. As, however, they were found in a Pusa soil in May, just after the "weathering" operation had taken place, it does not seem likely that the effectiveness of this operation can depend on their elimination.

Experiments on the effect of various forms of partial steilrization on anaerobic and aerobic bacteria showed that in general the former suffered more severely than the latter. Artificial "weathering" at 55° C. for 14 days eliminated all anaerobic organisms capable of developing on agar plates.

In conclusion, the writer suggests that an important result of weathering, in which the top 9 inches of soil become practically air-dry, may be to stop bacterial action and so conserve unchanged the organic matter which has not been previously decomposed; in other words, it would form a method of avoiding too rapid decomposition of organic manures, an effect which may be valuable under the high temperatures prevailing in India.

MANURES AND MANURING

1243 - **The Injurious Effects of Large Doses of Lime on Moor Soils.** — DENSCH, A. in *Mitteilungen über die Arbeiten der Moor Versuchs-Station in Bremen*, Fifth Report, pp. 331-352. Berlin, 1913. (1)

One of the fundamental measures adopted in the improvement of moors is liming; it has, however, frequently been observed that excessive applications of lime are injurious, so that now not more than 1800 lbs. per acre are given to arable land, whilst pastures and meadows, being less susceptible, may be given 3600 to 4000 lbs. per acre (2).

The causes of this injurious effect are not yet well known. The writer has especially studied, in a series of laboratory researches, the behaviour of nitrogenous compounds in similar conditions, and has arrived at the following conclusions:

I. The cause of the injury due to heavy liming on moor soil is connected with the nitrogen question.

II. The transformations of nitrogen in moor soils are essentially chemical, but a concurring bacterial activity is not out of the question.

III. In such moor soils, both limed and unlimed, losses of nitrogen, after a dressing with nitrate, are observed. On the intensity of such loss lime does not appear to exert a determined influence; these losses lower the utilization of the nitrogen but do not cause an absolute deficiency of this element.

IV. Under certain conditions an active leaching out of nitrate from peaty soils that have been limed may cause considerable losses, which, however, are limited to cases of exceedingly unfavourable weather.

V. In decomposing moor soil nitrate undergoes a partial reduction to ammonia and this to a great extent when the soil has been heavily limed. As intermediate product nitrous acid may be formed; this, however, may remain a fair length of time in the soil.

VI. It is highly probable that this formation of nitrites is one of the concurring causes of the injurious effects hitherto observed; of course without excluding other possible factors.

VII. Besides the nitrites, probably some nitro or nitroso compounds are formed, and it is not impossible that they also may be injurious to plants.

Lastly, in order to avoid the reduction of nitric nitrogen an energetic tiling of the soil is recommended, so as to favour an active oxidation of the nitrogen compounds.

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(1) See No 345, *B*. April 1913. (*Ed.*)

(2) See above: BERSCH, « Moor Cultivation in Austria ». p. 1675.

1244 - **The Residual Nitrogen from Green Manure in Sandy Soil as determined by Vegetation Experiments.** — VON SEELHORST, C. etc. — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 241, pp. 147 + 19 diagrams. Berlin, 1913.

Practical experience has shown that, in sandy soils, the nitrogen introduced with green manures, though often considerable in amount, appears to remain wholly, or nearly wholly, unutilized.

This may be due to:

a) leaching;

b) losses due to denitrification and the liberation of ammonia into the air;

c) the solubility of organic residues;

d) the fixation of nitrogen in an albuminoid form. The last cause must, by the fact of the scanty utilization itself, be excluded; there then remain the three other causes, which have been the object of the experiments discussed.

These experiments were carried out in boxes 10 feet square and 4 ft. 6 in. in height. They were filled with heath-sand, resting upon a layer of pebbles and river-sand, and covered by a little heath-humus; a total of 4349 lbs. of dry substance with about 1.17 lb. of nitrogen. The final scheme of the experiments is given in Table I.

The manure consisted of 40 gms. of 40 per cent. potash salts and 40 gms. of superphosphate per box, except in the case of No. 14; all the boxes were inoculated with lupin-soil.

The final balance of nitrogen is shown by Table II.

These complete data, which confirm the partial data, permit of some statements of general practical importance being made.

The amount of nitrogen yielded by the boxes planted with cereals is less than that yielded by the boxes planted with potatoes; on the other hand, the nitrogen content of the cereal crops is greater than that of the tubers, the difference being due to the fact that the boxes containing the potatoes lose more water by drainage than those planted with cereals. Further, the utilisation of nitrogen was minimum when the green manure was applied early, while it was perceptible when this was dug in late. In calculating the utilization of nitrate of soda per year and acre, and taking it on an average as 55 per cent., we have for boxes 1, 7, 2 and 8, the following figures respectively: 1.7, 1.6, 2.2 and 2.4 gms.

Most of the unused nitrogen is thus carried off by the drainage water; leaching is less in the case of cultures of cereals than in those of potatoes, which proves that the latter require less water, and therefore more water drains off; nevertheless, in the case of late potatoes, the loss can be modified. In all cases, the losses by drainage were larger with autumn green manure than with that spread in the spring; this was especially true for potatoes, for during the slow developement of the latter, the green manure retained, together with the nitrogen, a considerable amount of water. Thus the nitrogen content of the crops was always larger with spring than with autumn green manure. As a rule, the late use of green manure is of distinct advantage, especially for hoed crops.

TABLE I.

Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904–07	Green manure of blue lupins (1907 peas)												1904 Barley	1904 Fallow
	Dug in deep						Dug in superficially							
	Spring		Autumn				Spring		Autumn					
1905–08	Potatoes	Barley	Potatoes	Barley	Potatoes	Rye	Potatoes	Barley	Potatoes	Rye	Potatoes	Rye	Rye	Fallow
1908–09	Rye													Fallow
1909–10	Italian Rye Grass													Fallow
1910	Buckwheat													Fallow

TABLE II. — *Balance of nitrogen.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nitrogen of the crops:														
1904-07 . . . . . . gm.	17.966	18.835	10.413	10.408	9.282	9.371	17.794	19.292	10.063	10.964	9.089	10.683	9.452	—
1908-10 . . . . . . »	6.727	8.563	5.985	7.233	6.415	6.374	6.694	9.556	6.995	7.460	5.837	7.528	5.472	—
Total . . gm.	24.693	27.398	16.398	17.641	15.697	15.745	24.488	28.848	17.058	18.424	14.926	18.211	14.924	—
Nitrogen of the drainage water:														
1904-07 . . . . . . gm.	20.169	13.573	35.350	25.799	34.544	26.428	21.702	13.608	34.791	23.930	33.039	24.051	9.040	22.397
1908-10 . . . . . . »	8.687	8.860	7.696	6.525	7.959	8.505	9.610	8.083	8.740	6.978	7.775	6.772	3.534	5.505
Total . . gm.	28.856	22.433	43.046	32.324	42.503	34.933	31.312	21.691	43.531	30.908	40.814	30.823	12.574	27.902
Total nitrogen of crops and of drainage water. gm.	53.549	49.831	59.444	49.965	58.200	50.678	55.800	50.539	60.589	49.332	55.740	49.034	27.498	27.902
Nitrogen of green manure »	49.762	54.840	41.308	42.732	40.341	35.169	53.259	55.150	42.175	36.088	37.110	35.961	—	—
Residuum, October 1, 1910 gm.	— 3.787	+ 5.009	— 18.136	— 7.233	— 17.359	— 15.509	— 2.541	+ 4.611	— 18.414	— 13.244	— 18.630	— 13.073	— 27.498	— 27.902

TABLE III. — *Amount of drainage water.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904-07 . . . . kg.	823.2	636.0	970.9	860.5	1 006.1	859.9	820.0	660.1	965.9	860.2	1 054.8	867.7	1 120.6	1 287.3
1908-10 . . . . »	680.4	653.8	698.2	669.3	712.8	682.5	716.8	620.2	683.7	712.1	702.2	666.7	657.0	752.2
Totale . . . kg.	1 503.6	1 289.8	1 669.1	1 529.8	1 718.9	1 542.4	1 536.8	1 280.3	1 649.6	1 572.3	1 757.0	1 534.4	1 777.6	2 039.5

It should be noted that in the cases of box No. 13, which was continuously cultivated without green manure, and of No. 14, which lay fallow, the amount of nitrogen yielded was about the same ($^5/_9$ being in the crop and $^4/_9$ in the drainage water in the former case, and the whole in the drainage water in the latter case). This is the best proof of the importance of always keeping light soils in cultivation. The after-effects of the green manure were very different in the boxes planted with potatoes and in those in which cereals were grown. These differences did not appear in the loss of nitrogen by drainage, but were noticeable in the nitrogen content of the subsequent crop, which was larger in the plants grown after cereals, the increase being attributable to the action of the stubble. Further, when it is stated that the differences in the residues at the close of the experiment were much greater than those of the after-effects, it must be considered that the nitrogen residue is not present in the soil, and that the nitrogen which is not utilised by the crops, and not lost in the drainage water, becomes denitrified, while the after-effects are due to the stubble. On the contrary, no decisive after-effect of the green manure can be attributed to its having been dug in deeply or superficially, except perhaps as regards cereals in the second case.

The favourable after-effects of the stubble are, on the contrary, evident and must be attributed, not only to the fact that it retains some of the nitrogen by checking leaching, but also to the useful action of its decomposition products upon the activity of nitrogen-fixing bacteria. It cannot otherwise be explained how, with a greater initial deficit in nitrogen, boxes 6,10 and 12, which were planted with cereals, yielded in 1910 a larger amount of nitrogen than boxes 1 and 7, in which potatoes were grown.

1245 – **General Situation of Nitrate of Soda at the End of the First Half-year 1913.** — Browne, A. G. (Gerente interino) in *Asociación salitrera de Propaganda Circular Trimestral*, No. 60, pp. I-LV. Iquique, August 1, 1913.

According to the last report of the managers of the " Asociación Salitrera de Propaganda " the situation of nitrate of soda in the whole world on June 30, 1913, was the following:

Production. — The data supplied by the establishments for the first half-year 1913 and the effective figures for the " nitrate " year, from July 1, 1912, to June 30, 1913, compared with those of the preceding year, are the following: (1).

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
tons	tons	tons	tons	tons	tons
1 354 175	1 208 540	+ 145 635	2 619 898	2 399 604	+ 220 294

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(1) See No. 785, *B*. July 1913. (*Ed.*).

Exportation. — For the same periods of time it was:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
tons	tons	tons	tons	tons	tons
1 211 491	1 018 219	193 272	2 632 157	2 441 451	190 706

Consumption. — The amounts consumed during the same periods were as follows:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
1 727 536	1 729 450	1 914	2 472 640	2 384 344	88 296

Summing up, the general situation from July 1, 1912, to June 30, 1913, was the following:

I.	Stock existing on June 30, 1912. . .	tons	616 289
II.	Actual production from July 1, 1912, to June 30, 1913.	»	2 619 898
		»	3 236 187
III.	Shipped, July 1, 1912 to June 30, 1913	»	2 632 157
IV.	Existing on June 30, 1913	»	604 030

Forecasts. — The following is a comparison between the forecasts for the nitrate year 1912-13 and the actual data:

Forecasted production	2 675 271	tons
Actual production	2 619 898	»
Difference	55 373	tons

Thus the forecast exceeded by 2.11 per cent. the actual output.

The production for the calendar year 1913 is expected to be about 2 717 000 tons, taking into account the fact that the effective output for the first half-year of 1913 attains almost one-half of the above figure.

This of course always assumes production to be free, for it might be modified if the law on the limitation of the production of nitrate in Chile were to come into force.

Market conditions. — The consumption of nitrate of soda by Europe and Egypt has not agreed with the previsions; whilst in 1912 there was an increase of 150 000 tons, in the first half of this year a decrease of 112 260 tons took place. This is attributed partly to commercial causes and partly to the favourable condition of the cereals in the spring.

In the United States on the contrary, consumption during the same period increased to such an extent as to counterbalance the diminution in Europe, and to avoid carrying over into the new season an excess of stock. The development of imports of nitrate into the United States is remarkable; in the month of May it reached 87 976 tons, the largest quantity hitherto imported.

Summing up, the total consumption of nitrate of soda in the "nitrate" year 1912-13 has exceeded that of the previous year by 90 000 tons; this increase was, however, limited by the shortage of nitrate available for the market and is 135 000 tons below the corresponding effective production.

1246 – **The Development of the Phosphate Industry in Egypt** (1). — *The Board of Trade Journal*, Vol. LXXXII, No. 875, p. 587. London, September 4, 1913.

According to a report issued by the Survey Department of the Egyptian Ministry of Finance, the existence of phosphates in Egypt was first shown by the Geological Survey in 1900. The exploitation of the deposits, however, was not commenced till 1908, and the rapid growth of the output of phosphates since then is shown by the following table.

	tons		tons
1908	700	1911	6 425
1909	1 000	1912	69 958
1910	2 397		

Now that some of the mines are connected by rail with the coast, the ont-turn of phosphates is increasing rapidly.

As there is no factory in Egypt for the manufacture of superphosphates, and as the local demand for phosphates as manure is at present negligible, practically the whole of the phosphates mined is at present exported. There are many low-grade deposits, however, which may in time become of commercial value if a demand should arise for raw phosphate as a manure.

1247 – **Relative Composition of Different Samples of Basic Slag.** — ROUSSEAUX, E. and JORET, G. (Yonne Agricultural Station). Composition comparée des scories de déphosphoration quant à leur teneur en acide phosphorique et en chaux. — *Bulletin mensuel de l'Office de renseignements agricoles*, Year XII, No. 8, pp. 957-959. Paris, August 1913.

The writers found that local farmers prefer to use basic slag of low phosphoric acid content (8 to 10 per cent.), believing that the deficiency of phosphoric acid is compensated for by the higher percentage of lime. Several different slags were analysed by the writers with the following results:

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(1) See No. 21, *B*: Jan. 1913. (*Ed.*).

	Phosphoric acid %	Lime %
Slags of poor quality:		
1	10.00	51.50
2	10.04	35.64
Slags of medium quality:		
1	15.88	51.50
2	15.50	35.00
Slags of high quality:		
1	17.60	50.84
2	17.60	43.77
3	18.22	52.75
4	18.88	41.45

These results show that slags of the same phosphoric acid content contain very varying proportions of lime, and that those with high phosphate content are not always the poorest in lime.

It follows that there is no relation between the proportions of phosphoric acid and of lime in slag, since its total chemical composition, depending on the materials from which it is produced, is very variable.

There is, therefore, no justification of the farmers' preference for a slag of low quality.

1248 – **Potash Deposits in India.** – HAYDEN, H. H. General Report of the Geological Survey of India for the Year 1912, Potash Salts, in *Records of the Geological Survey of India*, Vol. XLIII, Part I, pp. 20-21. Calcutta, 1913.

Potash salts have been found in the salt mines at Khewra and Nurpur (Salt Range, Jhelma, Punjab) by Dr. W. A. K. Christie, but owing to the deposits being overlain by seams of unsaleable marl which do not concern the mining authorities, their investigation is difficult. The principal potash-bearing bed found in the Pharwala section of the Mayo Mine was traced at various points for some 850 feet along its strike and over 250 with the dip, which is about N. 30° W., with an inclination of 20 to 50°. Its average thickness is six feet, and the potash content varies from 6.8 to 9.6 per cent. of K_2O. The distances given are indications of the comparatively extensive nature of the deposit, but they are not intended as a basis for calculation of the material available for extraction, as questions of expediency in pillar preservation complicate the issue.

Another seam eight feet thick and carrying 7.7 per cent. of K_2O was found in a prospecting drift in the Pharwala salt; what was presumably the same bed was struck in another prospecting drift 700 feet to the E. N. E.

In the Buggy section of the Mayo mine the only seam of any importance that was found was traced for about 150 feet along its strike, which is E. N. E. - W. S. W. The dip of the bed is about 35°, its average thickness two feet nine inches, and it carries 14.4 per cent. of K_2O. The seam thins out when followed upwards along the bedding: in another chamber, at a distance of 170 feet south from the nearest exposure, it was found to be only a few inches thick.

The seam in the Nurpur mine is exposed only in one place which is difficult of access. It dips S. S. E. at about 75° and at this point is six feet thick. A typical specimen from this deposit carried 14.1 per cent. of K_2O.

The potassium - bearing minerals of the salt formation are chiefly langbeinite and sylvin; kainite and blödite with a small percentage of potassium are often present in small quantities. The deposits are usually fine-grained mixtures of these minerals with common salt and kieserite. The economic bearing of the occurrences, together with questions of their mineralogy and genesis, will be discussed in a paper now in preparation.

1249 - **The Decomposition of Feldspar and its Use in the Fixation of Atmospheric Nitrogen.** — Ross, W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Dept. Agr.) in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 9, pp. 725-729. Easton, Pa., September 1913.

The extensive search for sources of potash salts which has been undertaken in the United States during the past two years has naturally led to renewed efforts in devising methods for its extraction from feldspar and other silicates (1). The total number of patents which are concerned in the extraction of potash from silicates is at least 40; the various processes may be considered in three groups as follows: 1) Processes which yield potash as the only product of value; 2) processes which yield potash, and some other saleable material as a by-product; 3) processes in which two or more operations are combined in one, yielding a fertilizer containing two or more of the essential plant foods (potash, phosphates and nitrogen) in available form.

Of the 40 patents which have been referred to, about half make no reference to any products of value which can be recovered other than the potash. From the results previously obtained, it is safe to conclude that the value of the product could not cover the cost of the operation.

Most of the others refer to the second group, and among the various by-products which are considered possible of recovery are: alumina, silica, pigments, raw materials for the manufacture of glass, and hydraulic cement. Some of these processes are being carried out on a relatively large scale, but no conclusive data have yet been obtained.

With regard to the third group, there is the old process of Charles Bickel. This consists in the treatment of feldspar with phosphate of lime and air-slaked lime, in oder to obtain both the potash and the phosphate in a soluble condition. It was however found, on investigation, that much potash was lost and that only 40 per cent. of the phosphoric acid was rendered citrate-soluble. A better result was obtained by adding to the mixture a little hematite and manganese dioxide and igniting the whole to about 1400° C. All the potash and phosphoric acid were thus obtained in a citrate-soluble condition.

The writer's object in the present investigation was to test the efficiency of ignited feldspar in bringing about the fixation of nitrogen, while there was the possibility of liberating potash at the same time.

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(1) See No. 1613, *B*. Dec. 1912. (*Ed.*).

The various processes for the fixation of nitrogen may be divided into four groups according to the products obtained, *viz.*:

a) Nitrates or nitrites.
b) Ammonia.
c) Nitrides.
d) Cyanides, or related compounds, as cyanamide.

The processes of the third group are based on the property possessed by some metals of fixing nitrogen with the formation of nitrides; it has been found that, instead of using the metal directly, a mixture of the oxide and carbon may be employed. The most noteworthy experiments in this direction have been made by Serpek ; in these nitrogen was fixed on a large scale with the formation of aluminium nitride by igniting bauxite (aluminium oxide) with carbon at 1800 - 2000° C.

The writer in his own experiments used a feldspar of the following composition :

Silica	64.32 %
Alumina	19.64 »
Ferric oxide	trace
Lime	0.16 »
Magnesia	0.08 »
Potash	13.72 »
Soda	2.18 »

The principal results of the experiment were as follows:

No. of experiment	Feldspar — gms.	Carbon — gms.	Calcium carbonate — gms.	Temperature of ignition — C.	Potash volatilized in percentage of total present	Nitrogen fixed %	
						of feldspar	of aluminium in feldspar
1	4	2	0.0	about 1200°	5.0	0.20	1.9
2	6	3	6.4	» »	—	0.83	8.0
3	4	2	4.3	» »	55.7	1.27	12.2
4	2	1	2.15	» »	—	1.44	13.8
5	4	4	4.3	» »	—	1.40	13.4
6	2	4	2.15	» »	38.0	1.45	13.9
7	4	2	2.15	» »	—	0.50	4.8
8	4	2	12.0	» »	78.0	0.44	4.2
9	4	2	0.0	» 1400°	41.3	1.00	9.6
10	4	2	2.15	» »	98.0	1.68	16.1
11	4	2	4.3	» »	100.0	6.10	58.5
12	2	4	6.0	» »	100.0	5.21	50.6

The increase of fixation with time of ignition is shown in the following table (referring to the experiments 3 and 11):

Time of ignition — hours	Temperature C.	Potash volatilized in % of total	Nitrogen fixed in % of feldspar	Nitrogen fixed in % of aluminium in feldspar
1	about 1200°	55.7	1.27	12.2
2	» »	68.9	1.34	12.9
4	» »	83.0	1.68	16.1
1	» 1400°	100.0	6.10	58.5
2	» »	100.0	7.44	71.5

Since the nitrogen in aluminium nitride amounts to 51.6 per cent. of the aluminium, it follows that the nitrogen fixed in the last two experiments is combined in a form that has, so far, not been determined. When boiled with water the material gave off ammonia very slowly, though the ammonia was evolved more rapidly when sodium hydroxide was used.

Equipment is now being installed to carry on the experiments on a larger scale and at higher temperatures. In the meantime it was thought advisable to publish the preliminary results obtained.

1250 – **The Consumption of Chemical Manures in the German Colonies.** — HILLMANN. Wanderversammlung Strassburg 1913, Kolonial-Abteilung, Geschäftsbericht für das Jahr 1912. — *Jahrbuch der Deutschen Landwirtschafts Gesellschaft*, Vol. 28, Part 2, pp. 429-430. Berlin, September 1, 1913.

An interesting index of the incipient development of the consumption of chemical manures in the German Colonies is afforded by the orders which were received by the Fertilizer Section of the German Agricultural Society. The quantities, in hundredweights, are given in the following table:

Thus, in 1912 a total of 39235 cwt, of chemical manures was sent to the colonies by the German Agricultural Society.

	Superphosphates	Doubl e superphosphates	Basic slag	Peruvian guano	Crude phosphate	Bone meal	Chloride of potash	Sulphate 'of potash	Kainite	Potash manures	Potassic magnesian salts	Nitrate of soda	Sulphate of ammonia	Cyanamide	Nitrate of lime	Lime and marl
The Planters' Association at Toyo	2	177	197	—	—	—	256	—	8	—	—	2	354	—	—	—
Id. in Kamerun	43	4 653	4 679	—	4 279	10	5 805	2 943	1 065	37	—	5	4 925	12	—	5 263
Id. in East Africa	—	655	8	—	6	2	292	—	—	—	—	—	718	2	2	—
Id. in New Guinea.	—	484	236	—	—	—	650	295	148	—	118	—	453	—	—	—
Id. in the Pacific.	—	136	—	—	—	—	124	—	—	—	—	—	136	—	—	—
Exports to S. W. Africa. . .	—	—	10	10	—	20	—	—	—	10	—	5	—	—	1	—
Total . . .	45	6 105	5 130	10	4 285	32	7 127	3 238	1 221	47	118	12	6 586	14	2	5 263

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

1251 - **Influence of the Partial Suppression of Food Reserve in the Grain on the Anatomy of Plants.** — DELASSUS, M. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 3, pp. 228-230. Paris, July 21, 1913.

The writer operated on the seeds of *Faba vulgaris, Lupinus albus, Vicia sativa, Cicer arietinum* and *Cucurbita pepo*, removing half the cotyledons; he then germinated the seeds, and compared the plants thus obtained with others grown from normal unmutilated seeds. In a previous investigation he recorded effects on the external morphology and general development of the plants, and in the present paper he shows how their anatomy was influenced. The total volume and the surface of the plants from mutilated seeds were considerably reduced, as were all the tissues, especially the fibrous and secondary tissues, whose differentiation was retarded; the number of vascular bundles was also diminished.

PLANT BREEDING

1252 - **Research on the Variability of the Sexes in *Cannabis sativa* L. and *Rumex Acetosa* L.** — SPRECHER, A. in *Annales des Sciences Naturelles, Botanique*, Vol. XVII, No 5-6, pp. 254-352. Paris, July 1913

Plants of *Cannabis sativa* and *Rumex Acetosa* were grown in 1909 on 8 plots, each of which received a different manurial treatment, in order to determine whether the proportion in which the sexes appeared was affected by the modified food supply. Further, the seed was sorted out into classes according to colour, size and germination energy in the case of *Cannabis sativa* and according to size only in the case of *Rumex Acetosa*, each class being sown on a subdivision of the manurial plot in order to determine whether a correlation could be established between the sex of the plant and the external characteristics of its seed. Out of a total of 38 400 *Cannabis sativa* seeds sown, 23 769 adult plants were obtained, but the following year, when the experiment was repeated with slight modifications, an unfavourable season caused only 4280 plants to survive out of 28 800 seeds sown. *Rumex Acetosa*, being a perennial, flowered the second year only, when a total of 6049 individuals was available for discussion.

The writer reviews the results obtained by other investigators on the same subject, and treats his own results according to the statistical methods of Davenport and Johannsen, from which he concludes that manuring has no modifying influence on the proportions of the sexes, and that the sex of the plants cannot be predicted from the external characters of the seeds which he investigated (colour, markings, size and weight). The proportion of sexes, though constant for each variety, differed considerably between the two plants considered, being 100 males: 112 females for *Cannabis sativa*, and 100 males : 204 females for *Rumex Acetosa*.

A large number of adult plants were measured and weighed to study the question of sexual dimorphism. It was found that in the case of *Cannabis sativa* the males were taller than the females, being as 120:100 at the flowering stage and 113:100 later on, but on the other hand the females were heavier than the males (130: 100). In the case of *Rumex Acetosa* the females were taller than the males (122:100).

Lastly, sap was extracted from a number of male and female plants of the same age and its osmotic pressure was determined as a means of measuring its concentration. The pressure, though very variable, was almost always higher in male plants than in females, and the difference appeared to be due to the organic material rather than to the inorganic salts, and to be attributable rather to a different stage of development of the plants than to inherent differences between the two sexes; or, in other words, the studies indicated that male and female plants do not mature their sexual organs at the same stage of development.

1253 – Position and Space given to Individuals in the Selection of Plants. — MITSCHERLICH, EILH. ALFRED in *Zeitschrift für Pflanzenzüchtung*, Vol. 1, Part 3, pp. 275-285. Berlin, July 1913.

In plant breeding, the selected individuals are certainly planted further apart in order to allow of their increasing as rapidly as possible; the space given is, however, never large enough to permit of the single plants developing without being affected by their neighbours. As, however, the comparison is primarily made between the selected individuals, and not between single groups of individuals, these plants must grow under the same external conditions, for only thus can a correct comparative judgment be arrived at respecting the internal characters, and individual characteristics of the selected plants. This can only be obtained by giving the latter sufficient space to exclude all possibility of reciprocal influence. Further, in order to ascertain the progress made in the selection process, we have two criteria: firstly, the average of all single observations, which show for instance, that the grain yield increases from year to year, or that the sugar yield of the beets increases. If the external factors are equalized from year to year, the progress of selection during the series of years in question follows the logarithmic function of the law of the minimum (Mitscherlich (1),) for the yield is here the function of the internal vegetation factors. This means that newly selected plants make more progress in the first year than in the second, and more in the second than in the third, etc. The second criterion of the progress of selection follows of necessity from the first; it is determined by the fact that the amount of probable deviation, which can be estimated from observations made upon all the offspring by means of the averages, and which show how far the single individuals deviate from the average for the time being, becomes smaller from year to year, and that consequently the selection is more constant in its transmission and can therefore be continued.

It is, however, impossible to draw such deductions with safety from the figures obtained by the methods of plant-breeding which are at present in use, because the influences of the neighbouring plants vary from year to year and thus prevent any estimation of the increased constancy of the variety, while the yearly varying external vegetative conditions hinder the progress made by the work of selection being recognized from the averages. The individuality of the plant, *viz.* the characters observed and required by the plant breeder, depend wholly upon internal vegetative factors. Consequently, the progress made by selected plants can only be estimated accurately if all the external vegetative factors are maintained year after year in as favourable a condition as possible. This is the goal which every plant-breeder must keep before him. There is, however, only one method to attain this end: the selected plants should be placed singly in pots sunk in the best soil available and watered daily with nutritive solutions, so as to keep the soil in a saturated condition throughout the whole vegetative period. In this manner, it is possible, by keeping the cultural conditions uniform, to show not only what the selected plants can do in general, but also how they behave under certain definite conditions, keeping these also year after year as uniform as possible.

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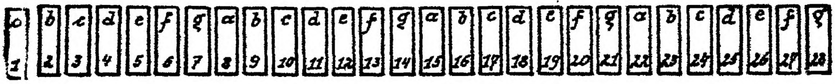
(1) *Bodenkunde für Land-und Forstwirte* 2nd Ed. Parey, Berlin 1913.
(*Author's note*).

The method of planting the selected individuals quite far apart (11 or 22 sq. ft. to each plant) and watering them as frequently as possible with nutritive solutions affords perhaps a transition to pot cultures. The soil round each plant must be kept very loose and clear of weeds. The soil of the breeding-plots should be homogeneous, and the subsoil permeable.

This method leads necessarily to a definitive breeding system which meets with all these requirements, *i. e.* pedigree breeding. Experience has fully justified the practice of first planting the offspring of selected individuals further apart, and deferring field cultivation to the second or third generation. But a number of difficulties are entailed, especially owing to the varying physical constitution and want of uniformity of large areas.

These conditions must be taken into account when comparing the yields of different strains, if any clear idea of the success of the selection operations is to be obtained. To this end, control plots must under all circumstances (not only in the case of the first and succeeding generation) be established and uniformly distributed throughout the experimental area. It is well, for the sake of security, to plant at least four plots of equal size, narrow strips being the most practicable. If the intermediate strips are to be turned to account, they should either be planted with seed from the same line or the same variety, or else another crop with a lower habit of growth than the lowest grown for comparison should be used in order to prevent the stems of various heights suffering from unequal amounts of shade.

The writer suggests the following scheme of arrangement for the plots.



Soil of similar composition should, as far as possible, be chosen. As less difference is likely to occur in a small area, the plots selected for comparison should be of limited size. This is practicable if the above scheme of planting is adopted. The comparisons are made between the yield of neighbouring plots, these being planted with different lines (as in the plots

1-7, 2-8, 3-9, etc., 20-26, 21-27, 22-28) and compared. In this manner, according to the example, 22 comparisons can be carried out. The fact that in this way the first and last experiment are only made once, the second experiment from the right and left hand only twice, the third only three times, etc., while the seventh experiment from each side and all the intermediate experiments are compared seven times, is justified because the value of the yield of the outside plots cannot be ascertained as accurately as that of those of the central plots, seeing that the variation of the soil in front of the first lot, and behind the last lot is unknown to us. In order to obtain the average from all these figures containing elements due to the differences of soil composition it is necessary to reduce all the results to numbers which are capable of comparison; this is done in the following manner. The average is taken of the crop of adjoining plots planted with different lines, *e. g.* of, lots 1-7 in the diagram. This is taken as m_1, m_1, representing 100. The crop (e) of each of the seven plots from which the arithmetical mean was obtained is reckoned according to this base.

Thus $\frac{m_1}{100} = \frac{e_1}{x}$, or $x = \frac{100\,e_1}{m_1}$.

In comparing the yield of plots 2-8 the average is again found and expressed as m_2 the calculation being effected in the same manner.

Comparable percentages are thus obtained which are independent of the absolute amounts of the crops and can thus all be treated alike. μ_a represents the average for all lines valued as α, with their probable deviations; the average of lines, of b value is taken as μ_b, etc. Further, the average M.; is also obtained of all the averages m_1, m_2, ...; so the actual figures are easily found by multiplying the single values μ_a, μ_b ... (and their probable deviations) by M and dividing the result by 100. In this way, the average values of the single lines (allowing for differences in the soil) are obtained and the defects of the crop resulting from the inequality of the soil are, as far as possible, excluded.

This method of reckoning is naturally only effectual when the parallel experiments already made show signs of unequal soil conditions.

The number of lines used for such an experiment can be either small or very large; in the last case, the only limit to the extension of the experimental ground is the increasing difference in the soil composition. If more than seven lines, or varieties, are used for comparison, it is well to have a second row of experiment plots and again to plant line α as a standard of comparison, etc ; by this means the method can be adopted in all cases.

CEREAL AND PULSE CROPS

1254 - **Experiment on Thick and Thin Seeding of Wheat carried out at the State Farm, Chapman, Western Australia.** — Report by GEO. SUTTON, Commissioner for the Wheat Belt of the State of Western Australia. *Communicated to the International Institute of Agriculture.*

An experiment to determine the correct amount of seed wheat to use for hay and grain crops was conducted by the Manager, Mr. J. Langfield, at the Chapman State Farm during the past year.

In this trial the effect of using three different quantities of seed per acre, *viz.* 30, 45 and 60 lbs., was determined.

The plots were arranged according to the attached sketch. It will be noticed that the plots were in pairs, so that one of the pair could be harvested for grain, the other for hay. A buffer plot or division, a drill width wide, was located adjacent to each pair of plots to facilitate harvesting operations. This division was cropped but was harvested for hay. Small uncropped divisions about two feet wide were left between the different plots to separate them. The first pair of plots and every alternate pair were planted with medium quantity (45 lbs.) of seed per acre. These plots were to act as check plots by which the yields of the other plots could be compared.

The land used for the experiment is a rather free-working sandy loam. It was fallowed 4 inches deep in the spring of 1911 with a shearer mouldboard plough.

As the paddock was very weedy, it was decided to delay the planting until the autumn rains had started the weeds and then destroy them by cultivation. This caused the sowing to be late. After the rains came and the weeds had germinated, the ground was cultivated twice with a spring-tooth cultivator. The seed was then drilled in with 80 lbs. of superphosphate per acre on June 15. After drilling the ground was harrowed.

The variety used was " Comeback ". The seed was obtained from the previous main crop of the Farm. It was not graded, but had been re-winnowed with a Bagshaw winnower, and the small grains taken out. After planting, the crop received no attention until harvest time.

When the crop was fit to cut for hay, the ends of the plots were trimmed off and the area reduced to ¼ acre each. The buffer plots were then cut out and the plots intended for hay harvested with a reaper and binder on October 14,1912.

The results obtained were as follows :

Hay Yields.

Plot — No.	Amt. of seed per acre — lbs.	Yield of plot — lbs.	Computed yield per acre — lbs.	Average of check plot — lbs.
2	45	663	2 652	2 670
4	30	580	2 320	
6	45	672	2 688	
8	60	602	2 408	2 464
10	45	560	2 240	

When the yields of the two check plots on either side of the other plots are averaged, it is seen that the results from the medium sowing are greater than from either the lighter or heavier. The difference in the case of the light sowing is at the rate of 350 lbs. per acre, and 56 lbs. in the case of the heavy sowing. In the latter case it is so slight as to be negligible. If the results of the medium sowing are expressed as 100 and the other results as percentages of this, they will be as follows :

Light sowing	87
Medium »	100
Heavy »	98

The other plots intended for grain were harvested with a stripper harvester on November 25, 1912. The results obtained were as follows:

Grain Yields.

No. of plot. —	Amt. of seed per acre — lbs.	Yield per plot — lbs.	Computed yield per acre — lbs.	Average yield check plot — lbs.
1	45	260	1 040	1 036
3	30	240	960	
5	45	258	1 032	
7	60	250	1 000	1 056
9	45	270	1 080	

The general results of the grain trial, like those of the hay plots, are in favour of the medium sowing. Expressed as percentages of the results from medium sowing the results are:

Thin sowing	93
Medium »	100
Thick »	95

The results obtained are those of only one experiment conducted in a single season. They cannot, therefore, be considered in any way conclusive. They are, however, suggestive and cause one to wonder whether the almost universal practice of sowing a bushel or more of seed per acre is a sound one.

The Rainfall at the Chapman State Farm during the year was as follows:

Rainfall 1912: *Chapman State Farm.*

January	0.00 in.	Prior to planting		
February	0.06 »			
March	0.09 »			
April	0.33 »			
May	2.13 »			
June 1-14	0.60 »	1.34 in.		
June 15-30	0.74 »		During growing period of hay section	During growing period of grain section
July	5.40 »			
August	1.65 »			
September	3.81 »			
October	0.83 »			
November	0.26 »			
December	1.36 »			

Total for Year	17.26 inches
Prior to planting	3.21 »
During growing period of hay section . .	12.43 »
During growing period of grain section . .	12.69 »

Sketch of thin and thick seeding.

	Buffer Plot.	45 lbs. per acre.	1 drill width	
1 2	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot	45 lbs. per acre. 30 lbs. per acre.	1 drill width 1 drill width	
3 4	Thin seeding.	30 lbs. per acre.		For grain For hay
	Buffer Plot.	30 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
5 6	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot.	45 lbs. per acre. 60 lbs. per acre.	1 drill width 1 drill width	
7 8	Thick seeding	60 lbs. per acre.		For grain For hay
	Buffer Plot	60 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
9 10	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot	45 lbs. per acre.	1 drill width	

FORAGE CROPS.
MEADOWS
AND PASTURES.

1255 - **Elephant Grass or Napier's Fodder: *Pennisetum purpureum*.** — WALTERS, J. A. T. in *The Rhodesia Agricultural Journal*, Vol. X, No. 6, pp. 833-836 + 5 plates. Salisbury, Rhodesia, August 1913.

This article is an account of the experiments conducted since the publication in February last (1) of a description of this grass as a new forage plant.

Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals it can hardly be excelled by any other crop in Rhodesia.

Propagation. — The best means of establishing a plot of this forage crop is by rooted slips planted singly in rows four feet apart and three feet between the plants. After two or three years it will be possible to transplant every alternate row, leaving the rows eight feet apart.

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(1) See No. 499, *B.* May 1913. (*Ed.*)

If cuttings are to be used they should be taken from mature plants in May or June and each cutting should be from 18 to 24 inches long and planted slantwise with about two-thirds below the ground.

This plant shows remarkable resistance to drought and frost and also responds readily to irrigation, but in damp situations where water is liable to stand, it wilts and is best replaced by paspalum. On dry situations, red or sandy soils, and in cold localities, it is much to be prefered to sugar cane and will give better results both in weight of fodder and food value.

Yield. — During 1912-13 the plot was cut twice when the plants had reached a height of 6 to 7 feet and before they showed the least signs of flowering. Each cutting gave 12 to 15 tons per acre of green fodder. If the cutting were delayed until the plant attained a height of 10 to 12 feet the produce of one cutting would amount to about 15 to 20 tons per acre and this would form good ensilage either alone or with maize or velvet beans.

FIBRE CROPS

1256 - **Cotton Farming in the Southwest.** — COOK. O. F. in *U. S. Department of Agriculture, Bureau of Plant Indnstry, Miscellaneous Papers, Circular* No. 132, pp. 9-18 Washington, July 1913.

The south-western States appear to be particularly suitable for the cultivation of cotton. The dry climate affords protection against the boll weevil and other pests that often reduce and destroy the crop in the East. The dry harvest season also allows the western cotton to be gathered and sent to market in better condition. But the possibilities of this region are not yet appreciated, and the agricultural population is still very small, resulting in a high cost of labour and transport.

The writer emphasizes the importance of a highly trained population capable of adapting themselves to local conditions and of producing a high-grade cotton of the Egyptian long-staple quality.

Present methods of living and work are unsuitable, and often end in disaster and discouragement. These conditions must be improved, better systems of houses must be constructed suitable for summer heat, and irrigation works extended.

1257 - **The Cultivation of Sisal Hemp in Tunis and the Production of Fibre from its Leaves.** — GUILLOCHON, L. and GAGEY, R. in *Bulletin Agricole de l'Algérie et de la Tunisie*, Year 19, No. 12, pp. 263-269. Algiers, June 15, 1913.

Experiments have been carried out with *Fourcroya gigantea* and *Agave rigida* var. *Sisalana* in the Experimental Garden at Tunis.

The results from six-year-old plants are as follows:

	Wt. of raw material kg.	Wt. of dry fibre kg.
Fourcroya	58	0.980
Agave	62	1.660

Thus Sisal gives a much higher yield of fibre. From calculations of the cost of cultivation the writers draw the following conclusions:

1) The cultivation of Sisal hemp is profitable in Tunis, provided the market value is high.

2) At the price of 3 ½ d. per lb. a net profit of 27*s* per acre per annum during the first six years and 13*s* per annum afterwards is possible; this is quite a good return for land of medium quality.

1258 - **The Cultivation of Cowstring Hemp *(Sanseviera).*** — MICHOTTE, F. in *L'Agriculture pratique des pays chauds*, Year 13, Nos. 122 and 123, pp. 356-375 and 455-474. Paris, May and June 1913.

The writer summarises the little knowledge available on the cultivation of this hemp; he shows that its cultivation may be of considerable importance, provided the mistakes so far frequently made are avoided.

The fibre obtained from this plant is very durable even under water and for this reason is very suitable for the manufacture of ship's ropes. When well prepared it has a higher market value than Sisal hemp. As a crop it has two distinct advantages: it can be harvested at any time of the year after it has grown to maturity, and may be decorticated a long time after harvesting with no more loss than a little extra work in removing the hardened parenchyma. It requires fewer machines, as they can be kept at work throughout the year; at the same time stoppages of the machines or of picking do not create any difficulties.

The writer finds it difficult to give details concerning the yield of this plant owing to the variability in the weight of the fresh leaves and the percentage of fibre, but he believes that it gives the highest yield of all the textile plants, varying from 5 to 5 ½ tons of clean fibre per acre.

Notwithstanding the advantages of this crop, its cultivation does not increase and this fact the author attributes to the unsuitability of machinery. For overcoming the difficulties of transport of the raw material (leaves) he suggests the adoption of light portable machinery of moderate capacity.

SUGAR CROPS

1259 - **Contribution to our Knowledge on the Influence of Sugar-Cane Cultivation on the Productivity of the Land when put under Maize and Rice.** — VAN DER STOK, J. E. and VAN HAASTERT, J. A. in *Archief voor de Suikerindustrie in Nederlandsch-Indë*, Year 21, No. 30, pp. 943-949. Sourabaya, July 1913.

The effect of sugar-cane cultivation on the soil and the crops which follow it has been receiving the attention of the Government in Java for some time, with a view to safeguarding the interests of the native cultivator who lets his hand to the sugar grower.

The authors conducted their experiments with 32 plots of 1300 Rhine feet (5 ¼ rods) each in area and divided into two series. Series A was planted with sugar-cane (variety No. 247) and series B was sown with earthnuts. In the following year the whole of the plots were planted with maize and the following yields obtained:

Series *A*.	0.6 picul (about 81 lbs.)
Series *B*.	0.4 picul (about 54 lbs.)

Thus the maize was benefited by the sugar-cane.

Next year rice was taken; allowing for experimented error, the yield was the same in the two series.

From these expeirments the writers conclude that the natives have no reason to fear the exhaustion of the soil by sugar-cane cultivation.

RUBBER, GUM AND RESIN PLANTS

1260 - **The Coagulation of Hevea Latex by Smoking.** — CAYLA, V. in *Journal d'Agriculture Tropicale*, Year 13, No. 146, pp. 231-236. Paris, August 31, 1913.

The writer states that plantation rubber has not yet been made equal in quality to that of "Up-river Fine Hard Para", the superior quality of which is attributed to the Amazonian smoking methods. He believes that the chemical composition of the smoke used on the Amazon has no such special action that other materials cannot be used for burning, but that the physical and mechanical conditions of coagulation and drying determine the ultimate quality of the rubber.

Mechanical effects — The layers of rubber coagulated by smoking are very different in quality from that of the commercial product.. The coagulum is of a creamy white colour, of medium elasticity and considerable plasticity. Its physical constitution is gradually changed and its volume reduced; water is given off and it darkens until it becomes black outside. This slow contraction continues for days and even weeks. In this way is effected spontaneously the work that is done by machinery in the plantation factories.. The coagulation of the latex in successive layers favours this spontaneous contraction, as each layer increases the compression of the inner layers.

The writer believes that the superiority of the spontaneous contraction of the Amazonian rubber over the mechanical pressing of the plantation product, lies in its slow, regular and continuous action, which has a very important effect on the quality of the rubber.

VARIOUS CROPS

1261 - **Exports of Tobacco from Hungary.** — (Abstracted from the "Commerce et Industrie de 1912 en Hongrie" published by the Chamber of Industry and Commerce at Budapest) in *Magyar Dohanyujsag*, Year XXX, No. 18, pp. 4-5. Budapest, September 20, 1913.

In 1895, the first year of reorganisation, the exports of Hungarian tobacco into the countries levying import duties amounted to only 4 800 000 lbs.; since then it has gradually increased, until in 1912 it exceeded 25 000 000 lbs.

During the last five years the Hungarian Tobacco-Merchants, Society has exported the following quantities:

	lbs.
1908	19 740 000
1909	20 710 000
1910	22 210 000
1911	20 980 000
1912	25 625 000

The quantities of tobacco exported from Hungary to various countries during 1912 are given below:

	lbs.
France	5 790 320
Netherlands	6 752 120
Belgium	1 030 610
Mediterranean Ports	5 469 240
Germany	2 700 600
Switzerland	1 554 200
Denmark	419 840
England	1 332 170
Egypt	156 310
Portugal	427 080
Total	25 632 490

1262 – **Coca and the Cocaine Industry in Peru.** — Pozzi-Escot, Emm. La Coca et sa Culture. Extraction de la Cocaïne. — *L'Agronomie tropicale,* Year 5, Nos. 4 and 5-6, pp. 39-52. Uccle, April-June 1913.

For many years Peru was the chief producer of coca, and consequently also of cocaine; but this cultivation is now practised with great success in the Far East. The increased production has lowered the price to one half its former value and left only a very narrow margin of profit for the grower. This situation requires the attention of the agriculturist and chemist before any improvement is possible.

The two principal coca districts of Peru are the upper valley of the Rio Chicama and the region of Huanuco.

1. *The valley of the Chicama.* — This valley is situated on the western slopes of the Andes and the crop is grown at an altitude of 1500 to 3000 m. (5000 to 10 000 ft). This region enjoys the dry climate characteristic of the high Cordillera, and the soil is poor.

2. *The Huanuco region.* — This region, known as the montaña, has a tropical climate: constant heat with high humidity. The soil is a rich alluvium, characteristic of damp tropical regions with luxuriant vegetation.

The coca of Huanuco is considerably richer than that of the Rio Chicama, the amount of cocaine in 1 kilo of dried leaves being 8 to 10 grams and 5 to 7 grams respectively in the two districts.

Cultivation under shade is easier, requiring less water and less work, and giving a greater total production of leaves. This is therefore, a better system of cultivation for exporting the raw coca, but the yield of alkaloid is considerably less than from plants grown without shade, sometimes only a third as much.

For increasing the yield of cocaine it is desirable to cut back the shrubs in order to encourage the development of young leaves which contain the highest proportion of the alkaloid. Before planting, the land should be entirely worked; the method of planting in pits must be abandoned, as the roots do not succeed in making their way out. The author recommends the use of dynamite for effecting this operation economically.

While in the growing of coca there is ample room for improvement, this is still more the case with the process of extraction. In this case it is advisable to pass the leaves through a mill and effect the extraction by diffusion, thus reducing the operations and obtaining a better yield. It would also be advantageous to collect the precipitate formed on the addition of alkali by means of a filter press.

A point of considerable importance is the extraction of ecgonin, which should be carried out by a methodical exhaustion of the leaves by means of a warm slightly acid liquid in diffusers similar to those employed in the tannin industry. This method would allow of utilizing the old or fermented leaves in which the cocaine has been destroyed, leaving only the ecgonin. By this method of extraction the yield of alkaloid is almost doubled and the industry made more profitable.

FRUIT-GROWING.

1263 - **Cultivation of Limes in Dominica.** — DESLANDES, R. and CHALOT, C. in *L'Agriculture pratique des pays chauds*, Year 13, Nos. 120 to 123, pp. 177-195, 306-327, 388-403 and 437-443. Paris, March-June 1913.

Lime growing is a profitable industry in several of the British Antilles. Along with cacao it has changed the economic feature of Dominica, which at the time of the sugar-cane crisis of 20 years ago had no other agricultural product to fall back on. This article points ont the value of the lime industry for the French Antilles and other countries liable to suffer the consequences of relying on a single crop.

The variety cultivated in the British Antilles is *Citrus medica* var, *acida*, which includes two cultivated varieties: the "common lime" and the "spineless".

The common lime produces a small fruit yielding a large quantity of juice. The spineless variety is of growing importance. The maintenance of the plantations and the picking of the fruits is easier and the content of citric acid is greater than that of the common lime, though the yield of juice is less.

The best conditions for growing limes are: 1) Altitude not greater than 400 m., (1300ft.; 2) rainfall of at least 100 to 120 in., distributed evenly throughout the year; 3) a gentle slope facing south or south-west; 4) soil rich in potash and nitrogen, and well drained; 5) proximity to a port.

The writers describe the various cultural operations. The pips are sown in nurseries and the young plants are planted ont when they have reached a height of 16 to 18 in.; they should be 15ft. by 15 ft. on the level, somewhat less on slopes. Some planters intercrop their trees with *Xanthosoma sagittifolia* and *Colocasia esculenta* for the first two years. Limes are greedy of nitrogen and potash. Green manuring with *Canavalia ensifomis* and *Cajanus indicus* suffices to supply the former. Suckers and dead branches should be removed as often as possible.

Limes are liable to the attacks of two scale insects: *Mytilaspis citricola* and *Lecanium viride*, which do considerable damage. Spraying with a parafin or soda-lye and resin wash is generally employed against these enemies. The lime borer (*Deptostilus praemorsus*) often causes serious damage. Cutting and burning the dead wood and blocking up the holes is adopted to kill the larvae.

Most of the fruits are used for the extraction of juice, and as the formation of acid is not completed until the fruits are fully matured, they are not gathered directly but allowed to fall to the ground. The average annual yield per acre varies between 22000 and 36000 lbs.

The juice is extracted in mills, rarely by pressure, and strained through a fine copper sieve to remove the organic matter which would give rise to fermentation and deteriorate the product. It is prepared for commerce in three forms: raw juice, concentrated lime juice and citrate of lime.

The raw juice is extracted by means of granite rollers to obtain the product as pure as possible. It is used in medicinal products and choice liqueurs, but owing to its lack of keeping qualities the quantities exported are decreasing.

Concentrated lime juice is obtained by evaporating the raw juice to $^1/_{10}$ or even $^1/_{12}$ of its volume. Owing to its concentration it has excellent keeping qualities and a low cost of transport.

The preparation of the concentrated juice involves several disadvantages: *a*) a loss of 8 per cent. of citric acid; *b*) use of considerable quantity of fuel; *c*) a dark coloured product; *d*) heavy expenses of packing with liability of loss.

To obviate these defects citrate of lime is prepared, as at Palermo, by the addition to the juice of a lime salt. This must be free from impurities such as magnesium, iron, alumina. The usual substance employed is spent lime prepared by burning corals. The point of complete neutralisation must not be reached, or the impurities will be precipitated in the citrate of lime. Complete neutralization is attained by means of chalk. The precipitate is washed by a jet of warm water, and put through a filter press and afterwards dried. It is brought to about 10 per cent. of water; it is then free from liability to ferment and contains about 70 per cent. of pure citric acid.

Some plantations prepare essence of limes; the profits from this fully cover the expenses of the treatment of the raw juice.

LIVE STOCK AND BREEDING.

HYGIENE

1264 - **Cattle Dipping at Short Intervals.** — LAWS, H. E., in *The Agricultural Journal of the Union of South Africa*, Vol. V, No. 6, pp. 871-879. Pretoria, June 1913.

Before the outbreak of East Coast Fever and the discovery by Lounsbury that it was transmitted by the brown tick, cattle dipping was not considered necessary more often than once a fortnight, or just sufficient to keep the ticks in check. When it was realised that this tick spends a comparatively short time of its life history on the host and it became necessary to eradicate it, more frequent dippings than once in five days had to be resorted to.

Four varieties of brown ticks: *R. appendiculatus*, *R. capensis*, *R.*

simus and *R. nitens,* and the red-legged tick (*R. evertsi*) are capable of transmitting the disease from a sick animal to a healthy one. The last-named tick has two hosts and spends more than five days on each.

The brown ticks, on the other hand according, to Watkins-Pitchford's investigations, require a minimum larval period of 68 hours and a nymphal stage of only 72 hours. It is therefore necessary to adopt a three-day dipping period in order to stamp out all the ticks from an infested farm.

This system, however, has not been an unqualified success in Natal and the Cape Province. The reasons for this are many. The larval and nymphal red ticks are usually found low down in the hollow of the ear, whilst brown ticks in all three stages infest both the inside and outside of the ears and around the eyes. Dipping baths are inadequate if the animal is not obliged to take a "header".

The strength of dip recommended for three-day dipping is one part arsenious oxide to 1250 parts of water—or 1 lb. arsenite of soda (80% arsenious oxide) to 100 gallons of water. Watkins-Pitchford found that this solution combined with an emulsion and applied every three days was sufficiently strong to stamp out East Coast Fever. It killed the ticks on the animal and the emulsion ensured a uniform protection against further pathogenic ticks.

The following experiments were carried out in March 1910 to ascertain what strength of dip is required, its effect on the cattle and at what intervals it must be used in order to prevent ticks from feeding on the dipped animals. No pathogenic ticks were available for these experiments, so that freedom from ticks had to be taken as sufficient criterion of the efficacy of any particular treatment.

Cooper's Cattle Dip was used in two strengths 1-150 (arsenious oxide 1 part in 600 parts of water), and 1-200 (arsenious oxide 1 part in 700 parts of water).

Infestation of the experimental cattle was maintained by allowing undipped infested cattle to run alongside them.

The dip was applied by hand spraying, and the cattle were thoroughly overhauled before and after treatment and the difference noted.

The animals were sprayed 20 times in all and generally all the brown and red ticks were killed at each spraying. After the second spraying no adult blue ticks were found. About 50 per cent. of the male bonts and a few of the female bonts were killed at each spraying. In one instance two female bonts stayed on throughout the whole series of experiments (94 days). No tick of any species engorged itself during the period.

As a result of these experiments the author concludes: 1) it is possible to apply an emulsion containing arsenious oxide (1 in 800) every four days and one of strength 1 in 600 every five days without injury to the cattle; 2) four-day spraying will keep cattle practically free from ticks in an infested area: 3) a hand dressing of the ears and tail is desirable to supplement the spraying: 4) whenever East Coast Fever threatens, all cattle should be dipped every five days with an emulsion of 1 in 800, and if an outbreak occurs, the interval should be reduced to four days.

1265 - **Experimental Investigations into the Relationship between Human and Bovine Tuberculosis.** — EBER in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 5-6, pp. 220-278. Jena, August 23, 1913.

Since early in 19[illegible]3, continuous investigations into the connection between human and bovine tuberculosis have been carried out at the Veterinary Institute of the University of Leipzig. Detailed studies have, so far, been made of tuberculosis in 16 children, 3 women, 12 men and 9 cows.

The writer first gives a detailed account of the order of the different operations in the experiment (inoculation of human material into cattle, introduction of bovine tuberculosis into cattle. etc.), and then gives the data of the experiments which are noted chronologically in an appendix and described from a uniform point of view. He concludes that bovine tuberculosis constitutes a source (and in the case of children, one which should not be underrated) of human tuberculosis. The presence in the alimentary canal of a child of the bacilli of bovine tuberculosis gives rise to alterations which may result in death, and in no way differ. either macroscopically or microscopically, from those due to the bacillus of human tuberculosis. Further, in the case of adults who have died from general tuberculosis, sometimes the bacilli of the bovine form have proved to be the sole pathogenic agents.

Systematic intraperitoneal, and simultaneous intraperitoneal and subcutaneous injections were made into cattle, using human bacillus which is harmless to the latter. The material was inoculated after passage through a guinea-pig. This treatment in many cases produced peritoneal tubercles; intraperitoneal and subcutaneous inoculations were simultaneously made from these and proved very virulent in their action on the cattle used for the experiment. The writer only once succeeded in producing similar effects by simultaneous subcutaneous and peritoneal injections of pure cultures of material obtained from human subjects,

While pure cultures from the peritoneal tubercles of the cattle first inoculated, when introduced by subcutaneous inoculation showed increased, but not yet typical, virulence, pure cultures from the peritoneal affections occurring in cattle which had died of acute tuberculosis due to inoculation were excessively virulent. In 2 out of the 7 cases of increased virulence, it happened that the material from the human subjects contained exclusively bovine tubercle bacilli, which from their long stay in the human body, had forfeited their toxi property, slightly in the one case, but to a considerable extent in the other. No such explanation exists in the other 5 cases of increased virulence; further, there is no ground for the belief that the bacilli of bovine tuberculosis were associated from the beginning with those of human tuberculosis in the material obtained from human subjects, or introduced in the course of the experiments.

The writer therefore regards the systematically increased virulence produced in these 5 cases by further inoculation as type changes, and considers it a proof of the near relationship between the two varieties of tubercle bacilli occurring in mammals, and entitled by Kossel, Weber, and Hanss, *Typus humanus* and *Typus bovinus* respectively. Whether the change of type is caused by certain peculiarities of the bacilli present in the human material, or by the individual characteristics of the cattle experimented upon, or whether it depends upon both these factors, the writer could not determine.

ANATOMY AND PHYSIOLOGY

1266 – **Contributions to the Knowledge of the Ferments of the Mammary Glands and of Milk.** — GRIMMER, W. in *Biochemische Zeitschrift*, Vol. 53, Part 6, pp. 429-473. Berlin, July 24, 1913.

The object of the investigator was to determine whether milk ferments are present in the mammary glands, and whether resting or active mammary glands show any difference in their ferment content. The glands of cows, mares, ewes and sows were used in the investigation. They were first freed from all visible blood vessels, and from the connective tissue and fat, and then crushed to a pulp. From the latter, extracts were obtained by auto-digestion and by the use of common salt and of glycerine, and a juice by pressure. All of these were tested by the writer with the following ferments: protease, ereptase, monobutyrase, amylase, salolase and peroxydase. In many cases, an examination of the milk followed that of the mammary glands.

The results are given in seven tables, and show that proteolytic ferments were present in the resting and active mammary glands of the four species investigated. The only difference was that the products of protein decomposition from the active glands always contained tryptophane, which was not the case in the resting glands. This discovery leads to important conclusions regarding the function of active mammary glands. The function of the proteolytic ferment of resting mammary glands is probably, like that of the proteolytic ferment present in other organs, to bring about the metabolism of the cells of the gland, and for this the disintegration of tryptophane is unnecessary. On the other hand active mammary glands, which produce casein, require a ferment to effect the synthesis of this compound. The writer believes that the body protein when turned into milk protein is entirely split up into its components. This is rendered probable by the fact that the auto-digestion products of the resting glands always contain albumoses and peptone, substances which are absent from the active glands.

In his investigations of ereptase, the writer found that the extracts of active and resting glands were able to separate tyrosin from silk peptone. Whether this separation was due to the proteolytic ferments, or to ferments which only split up peptones and polypeptides, could not be discovered. It is probable that the peptolytic and proteolityc ferments are not the same. The peptolytic ferment is much weakened by the autolysis of the glands and also by the dialysis of the extracts and press-juice.

The active and resting mammary glands of all the animals examined also contained a monobutyrin-splitting ferment, the effect of which was much diminished by dialysis. It is therefore probable that the mammary glands are the source of the monobutyrase of milk.

The mammary glands of mares and sows possess, in the resting and active stages alike, a powerful ferment for breaking up starch. In the case of the cow the resting glands have much more power of breaking up starch than the active ones. The resting glands of the ewe have no special amylolytic property. From this, the writer concludes that the amylase in the milk of different species is an original ferment.

All the press-juices and salt extracts examined also have the power of breaking up salol. Contrary to the opinion hitherto held, the writer believes that this power of decomposing salol is not a saponification due to alkalinity, but a pure ferment action. This is rendered probable by the fact that, through dialysis, the alkaline reaction of the extracts with litmus wholly disappears without any loss of the power of breaking up salol. Further, salolase can be destroyed by heating neutral solutions containing it and without appreciably altering their alkalinity. The writer also succeeded in precipitating the salol-disintegrating agent by means of ammonium sulphate and subsequently re-dissolving the precipitate with water.

As a result of his investigations of peroxydase, the writer concludes that the power of oxydising guayacum tincture possessed by the milk of cow, ewe and goat is not attributable to inorganic catalytic agents, but is a process of a ferment nature. This ferment should be regarded as original and formed when the gland begins active secretion. No ferment capable of colouring guayacum tincture blue seems to exist in the glands of mare or sow, in the resting glands of cow or ewe or in sow's milk. In these, the writer merely found in all cases a ferment which oxydises paraphenylenediamine and was easily destroyed by heat.

In conclusion, the writer touches on the functions of these ferments; he thinks that they are concerned with milk production, but does not explain the part they play in the process.

BREEDING

1267 - **A Method of Determining Early Stages of Pregnancy in Mares.**— BERNHARDT in *Zeitschrift für Gestütkunde und Pferdezucht*, Year 8, Part 7, pp. 145-148. Hanover, July 1913.

The investigations made by Professor Abderhalden at Halle-a-S. regarding the ferments present in the bodies of animals have proved that substances foreign to the species, and especially those foreign to the blood, when introduced directly into the latter, quickly disintegrate and disappear. This disintegration is due to the action of ferments which make their appearance shortly after inoculation (sugar after a few minutes, and protein within three or four days). The introduction of substances proper to the blood, on the other hand, leads to no ferment formation. If the substance used for inoculation is protein, the ferments which develop are protein-destroying enzymes; if raw sugar is introduced, the ferments formed are those which possess the property of breaking up sugars. The introduction of fat into the blood by means of a diet rich in fatty substances leads to the production of ferments which split up fat. The power possessed by the blood of breaking up these compounds lasts for from two to three weeks after the introduction of the latter, and disappears as soon as the foreign substances become incorporated into the blood.

Protein-destroying ferments are therefore always to be found in the blood of an animal when it becomes pregnant. These ferments have the property of breaking down placenta-protein; they disappear again in from 10 to 14 days after the birth of the young. Animals which are not pregnant have no ferments in their blood plasma capable of breaking up placenta-protein.

On the basis of these observations, Prof. Abderhalden has devised a chemico-biological method by means of which it is possible to determine whether an animal is pregnant or not, the earliest stages being capable of detection (1).

The writer gives a description of this method, and sets forth in detail how it may be applied to mares. The method consists in introducting into the blood serum of a mare a fragment of placenta-protein foreign to the species ("Artfremd"); the mixture is dialysed and the product investigated. If peptone is present, this testifies to the existence of ferments in the mare's blood; if the peptone reaction is absent, the blood lacks ferments. Thus, according as to whether the blood contains ferments or not, the pregnancy or non-pregnancy of the mare can be determined. The reliability of this method depends upon the care with which it is carried out. It is therefore advisable to follow carefully the given directions:

I. — *The composition and preparation of the dialysing membranes.*

The best membranes are those supplied by Messrs Schleicher and Schüll (Germany); these are supplied to the market marked 579 A. As soon as they arrive the membranes should be boiled for 5 minutes in distilled water; they should be kept in the same water. Before use, the membranes must be tested for impermeability to proteins and permeability to peptones. These tests are carried out as follows:

a) *Test for impermeability to protein.*

5 c.c. of freshly filtered egg-albumen are put in a graduated cylinder, water is added to make up 100 c.c, and the whole well shaken to mix it. Then 2.5 c.c., of this mixture are placed in a membrane which has been softened for ½ hour in cold water, the exterior of the membrane is well washed, and the membrane placed in an Erlenmeyer flask containing 20 c.c. of distilled water. Upon the membrane and the contents of the flask a ½ cm. layer of toluol is poured. The whole is now covered with a watchglass and put into an incubator to dialyse. After 16 hours, the solution may be tested for protein. For this purpose, 10 c.c. are placed with 0.2 c.c. of 1% solution of ninhydrine (triketohydrindenhydrate) in a graduated reagent glass, mixed, and boiled over a Bunsen burner (a sterilized glass rod 10 cm. long being introduced to prevent bumping). The whole must be well boiled (every membrane alike) but loss of substance should be avoided. The time when the first gas bubbles appear on the side (usually after a few seconds) is noted; the glass is then held in the flame till the liquid boils

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(1) A description of the scientific principles and of the technique of the method are given by the above-named investigator in his book: "*Abwehrfermente des tierischen Organismus*", 2nd Edit. Springer, Berlin.

We are indebted to this work for the description of the method, and have made use of it to some extent in making this abstract. (*Ed.*).

vigorously; it is then held in the side of the flame half way up till one minute has elapsed from the appearance of the first gas bubbles. When the reagent glasses are cool, the colour of the fluid is examined. If it is colourless, the membrane which contained it is impermeable to protein; if the liquid is coloured blue, the corresponding membranes are useless and should be rejected.

b) *Test for equal permeability to protein decomposition products.* — All the membranes which have been proved to be impermeable top rotein, are thoroughly cleaned by being first placed for ½ an hour in flowing water and subsequently ½ minute in boiling water. They are then prepared with 2.5 c.c. of 1 % silk peptone solution ("Pepton Höchst"), washed externally and placed in a flask with 20 c.c. of sterilized water. The contents of the flask and the membranes are again covered with a ½ cm. layer of toluol and a watchglass, and are placed in an incubator to dialyse. After 16 hours, the dialysed solution is examined for diffused peptone, the same method being used as in the case of the protein. The water in which the membranes were boiled, in all the reagent glasses, should, if the membranes are all equally permeable, be coloured the same degree of blue. If the tint given by some membranes is lighter or darker than the average colour, the membranes are to be rejected as worthless.

The good membranes are first washed, then placed in boiling water for 30 seconds, and finally put into sterilized water to be kept.

The flasks in which they are preserved must be quite full of water.

II. — *Preparation of the placenta protein.*

After the membranes have been tested, the placenta-protein is prepared. Fresh placenta only should be used. This is first externally freed from blood by being put into a physiological solution of common salt; the chorion and the umbilical cord are then removed and the placenta is cut into pieces about the size of a shilling and crushed in flowing ordinary water. The pieces are pressed in a cloth from time to time. All those which are not easily freed from blood are rejected. The others are then reduced to a pulp until they form a snow-white mass of tissue, and boiled in an enamelled pot with 100 times their volume of distilled water containing five drops of glacial acetic acid per litre. The pulp is boiled for 10 minutes, the water is poured off through a hardened filter and washed; the pulp is then washed for 5 minutes in distilled water, and the boiling is repeated, fresh water being used without the addition of acetic acid. This process is best repeated about six times without interruption. Finally the boiled water (filtered) is tested for protein decomposition products, 5 c. c. of the liquid being mixed in a beaker with 1 c. c. of 1 % ninhydrine solution, and the whole boiled over a burner, as in the case of the membrane testing. If a blue colouration appears, the mixture is boiled till this is no longer visible. At this point, the placenta is placed in sterilized water in a bottle with a ground-glass stopper, covered with a layer of chloroform and toluol reaching to the stopper, and set aside. Placenta-protein thus prepared keeps a long time.

III. *Method of obtaining the blood serum.*

Blood to the amount of 15 to 20 c. c. is taken from the mare to be investigated when the animal is fasting; a dry needle is used for the operation, and the blood is at once placed in a sterilized centrifugal glass, or Erlenmeyer flask. Here it is allowed to coagulate; the serum is poured off into a sterilized vessel and submitted to centrifugal action; if there is no centrifugator the serum is left to settle in long-stemmed glasses closed by means of a rubber cap. It is necessary that the serum should be quite free from haemoglobin. After all these preliminaries have been carried out, the serum is examined for ferments.

IV. *Method of conducting the investigation.*

2 or 3 c. c. of serum are taken up in a dry pipette and placed in a tested membrane together with 1 gm. of well-shredded placenta (which has previously been examined for peptone). The exterior of the membrane is washed and the latter is put into a flask containing 20 c. c. of sterilized water. A layer of toluol ½ cm. deep is poured on the contents of flask and membrane and the flask is covered with a watch glass and stored in an incubator at 37° C. for the solution to dialyse. After 16 hours, 10 c. c. of the dialysed solution and 0.2 c. c. of 1 % ninhydrine are poured into a beaker and heated over a Bunsen burner, the same rules being observed as in the cases of the membrane testing and the examination for protein. If after the cooling of the contents of the test-tube, a deep blue colour (amethyst) appears, this proves that the serum in question contains ferment capable of breaking up placenta-protein, and therefore that the mare is pregnant. If the dialysed solution does not react with ninhydrine the mare is not pregnant. Should yellowish-red or brownish tints appear, this shows, either that the experiment has not been sufficiently carefully performed, or that the blood contains much acid or alkali. In this case, the experiment must be repeated.

The experiments should be carried out as far as possible under aseptic conditions and in an entirely bacteria-free room. The methods are, of course, suitable for adoption in the case of all other animals.

1268 - **Results of Investigations on Heredity in Pigs** (1). — Fröhlich, Gustav in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 217-235. Berlin, July 21, 1913.

The writer reviews the observations made in Germany and the United States on the heredity of coat colour in swine. It appears that in the F_1 generation of crosses the following are dominant:

I. *White* of Improved German Swine (Edelschwein) over:
  white and black of Hanoverians
  black of Berkshires
  greyish-black of European wild pigs
  greyish-black of Cornwalls
  red of Tamworths.
  black of Caucasian wild pigs.

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(1) An article by W. W. Smith on « Color Inheritance in Swine » in *The American Breeders Magazine*, Vol. IV, No. 2, will be abstracted in the *Bulletin* for Jan. 1914, as it was received too late for the official edition (French) of November. (*Ed.*).

II. *Greyish black* of European wild pigs over:
red of Tamworth.
III. *Black and white* of Hampshires over:
red of Tamworth.

1269 - **Report on the Woburn Calf-Rearing Experiment, 1912-13.** — VOELCKER, J. A. Leaflet published by the *Royal Agricultural Society of England*, pp. 7. London, 1913.

CATTLE

This report is supplementary to the general summary published in the Proceedings of the Council, November 6, 1912, and contains further details regarding the quantities of food and methods of feeding.

Twenty bull calves (Shorthorns) were purchased in the open market when two or three days old and fed at the experimental farm on whole milk for three weeks. They were then weighed and divided into five lots according to their weights. Each lot was then put on its special diet for a period of nine weeks.

The particulars concerning each lot and its diet are as follows:

Lot 1. *Cod-liver oil and separated milk.* — The object of this experiment was to replace the fat removed from whole milk by cod-liver oil.

During the first three weeks the four calves consumed 86 gallons of whole milk costing 4*s* 2.16*d* per calf per week. The diet was then changed gradually, 4 ⅓ gall. whole milk and 1 ⅓ gall. separated milk mixed with eight table-spoonfuls of cod-liver oil being consumed during the first six days. After a fortnight the whole milk went down to 2 ⅓ gall. and the separated milk up to 3 gall. daily, and after three weeks the four calves were receiving all separated milk (6 gall. daily per lot) and so continued until the close of the nine weeks, the cod-liver oil being increased after four weeks to twelve tablespoonfuls daily. The total food consumed during this period of nine weeks by the four calves was: cod-liver oil 2 gall., whole milk 59 gall., separated milk 307 gall. — total cost £ 4 16*s* 7*d*, or 2*s* 8.19*d* per calf per week. Including the preliminary three weeks on whole milk the cost comes to £ 7 6*s* 9*d* for the twelve weeks, or 3*s* 0.68*d* per calf per week.

Lot 2. *Calf meal* (*commercial*). — As before the calves had whole milk for the first three weeks. After the weighing they took for the first week 2 ⅓ gall. of whole milk and 1 ⅓ gall. of separated milk daily along with 2 gall. of calf meal. The whole milk was gradually reduced and after three weeks the four calves took only 4 gall. daily of separated milk with the 2 gall. of calf meal. The total food consumed in the nine weeks was: calf meal 112 lbs., whole milk 37 gall., separated milk 212 gall. — Total cost £ 3 11*s* 11*d*, or 2*s* per calf per week.

Lot 3. *Gruel* (*linseed and oatmeal*) *with separated milk.* — As before the calves had whole milk for the first three weeks. For the first week after weighing, they had 4 ⅓ gall. whole milk with 1⅓ gall. separated milk daily and ⅓ gall. daily of gruel. After three weeks they were taking 4 gall. daily of separated milk and 1 ½ to 2 gall. of gruel for the lot of four. One calf had to be removed from the experiment on account of scouring and is left out in the final reckonings. The total food consumed in the nine weeks by the four calves was: oatmeal 84 lbs., linseed 14 lbs., whole milk

57 gall., separated milk 224 gall. — cost £ 4 6*s* 4*d*, or 2*s* 7.77*d* per calf per week.

Lot 4. *Whole milk.* — This lot continued the whole milk diet throughout; in nine weeks they consumed 356 gall., costing £ 10 7*s* 8*d*, or 5*s* 9.22 *d* per calf per week.

Lot 5. *Crushed oats and separated milk.* — These animals were bought a fortnight later and consumed rather more milk during the first three weeks. For the first six days of the experiment they took 1 lb. of crushed oats among them daily; as the proportion of separated milk was increased the oats were increased to 2 lbs. daily. After 24 days they were receiving 6 gall. of separated milk and 4 lbs. of oats daily. The oats were always given dry and never mixed up with the milk or made into gruel. During the nine weeks they consumed 208 lbs. of oats, 66 gall. of whole milk, and 296 gall. of separated milk, costing £ 5 0*s* 10*d* or 2*s* 9.61*d* per calf per week.

The results obtained by the different systems of feeding are compared in Table I.

TABLE I.

Lot	Food	Increase per calf per week	Coat of each lb. increase of live weight
		lbs.	*d.*
1	Cod-liver oil	9.66	3.33
2	Calf meal	8.66	2.77
3	Gruel	8.33	3.45
4	Whole milk	12.83	5.39
5	Crushed oats	13.30	2.52

From this table it will be seen that the crushed oats gave the highest gain in live weight and at the lowest cost per lb. of increase. The next highest gain was with whole milk, but the cost, it will be noticed, was much increased. Between the other feedings there was not much to choose.

At the end of the nine weeks of special feeding the calves were turned out into the yard and all fed alike with separated milk, a little linseed cake and crushed oats. Later the milk was given up and they were turned into the fields and given linseed cake, crushed oats and hay. Shortly after this (at nearly 5 months) they were castrated. At the end of twenty weeks they were weighed again and the results obtained are set forth in Table II.

TABLE II.

Food	1st Period		2nd Period.	Whole Period.
	Average daily gain per head	Cost per head per week	Average daily gain per head	Average daily gain per head
	lbs.	s d	lbs.	lbs.
1. Cod-liver oil	1.90	2 8.19	1.63	1.74
2. Calf meal	1.75	2 0	1.53	1.62
3. Gruel (3 calves) *	1.57	2 4.67	2.01	1.84
4. Whole milk	2.00	5 9.22	1.90	1.94
5. Crushed oats (3 calves) **	2.19	2 9.61	1.90	2.00

* One calf removed from experiment owing to scouring.
** The calf died from anthrax.

Table II shows that not only did the crushed oats and separated milk feeding give the highest gain at the least cost during the feeding of nine weeks with the special foods, but that subsequently, when the calves were turned out in the fields and all fed alike, the total live weight continued to be higher with this lot than with any of the others. This leads to the conclusion that the influence of the early feeding of calves has an important bearing on their after development and that a "good start" is very essential.

It is intended to carry on this experiment until the bullocks are ready to be sent to the butcher.

1270 - **Experiments on Pig Fattening in Prussia with Automatic Feeder or Common Trough.** — DE LA BARRE in *Tierzuchtnachrichten der Landwirtschaftskammer für die Provinz Brandenburg und Mitteilungen der Versuchsstation für landwirtschaftliche Fütterungsversuche zu Karstadt* (*Westprignitz*), Year 6, No. 8, pp. 114-117. Prenzlau, August 31, 1913. PIGS

The object of these experiments was to ascertain which of the two methods of feeding was the more expensive. Sixteen pigs, eight weeks old, of the improved Hanoverian breed were used: they were divided into two lots. Shortly after the beginning of the experiment one animal was removed from each group.

Group I was fed by an automatic feeder (Holtenberg's system) and group II was fed from a common trough three times a day with food slightly moistened with warm water. During the first eight days of the experiment the pigs received as drink 2 litres (1 $^3/_4$ quarts) of centrifugated skim milk to which some wheat meal and barley groats were added. The fattening was continued until the average weight of 220 lbs. was reached.

The composition of the rations during the experiment is shown in Table I.

TABLE I.

Age of pigs in weeks	Barley groats	Wheat feeding meal	Potato flakes	Körnerblutfutter (grain and blood food)	Fish meal	Maize groats	Rye groats	Quantity given daily to each pig of group II
	Parts							lbs.
8	12	6	2	2	1	—	—	1.16
12	4	2	2	1	1	2	—	1.76
16	6	4	5	2	2	5	—	3.19
20	8	6	6	2 ½	2 ½	8	—	4.29
24	8	6	6	1	2 ½	8	2 ½	5.83
28	8	6	6	1	2 ½	8	2 ½	6.93
30	8	5	5	1	2 ½	8	2 ½	7.48

Lot I attained at the age of 28 weeks all but one day the desired average weight of 1 quintal (220 lbs.) per head; lot II reached it at the age of 30 weeks and one day.

The cost of the food for the first lot was £ 19 12*s* 3*d* and for the second £ 17 14*s* 0*d*.

The increases of weight at the different ages are given in pounds in Table II.

TABLE II.

Periods in weeks	Lot I (7 pigs)			Lot II (7 pigs)		
	Initial weight	Final weight	Increase during period	Initial weight	Final weight	Increase during period
8 to 12	216	404	188	224	334	110
12 » 16	404	641	238	334	508	174
16 » 20	641	950	309	508	746	238
20 » 24	950	1 257	307	746	104	298
24 » 28	1 257	1 540 (27 days)	283	104	1 351	307
28–30 + 1 day . . .	sold		—	1 351	1 540	189

The following figures give the results of the fattening:

Lot I.

Receipts

	£	s	d
7 pigs (total weight 1540 lbs.) £5 13*s* 8*d* each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	19	2	11			
Attendance 139 days	2	7	8			
Insurance	2	1	2	33	3	10
Net profit				£ 6	11	10
Net profit per head					18	10
Cost of production of 1 cwt. of live weight				£ 2	8*s*	2*d*

Lot II.

Receipts

	£	s	d
7 pigs (1540 lbs.) at £ 5 13*s* 8*d* each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	17	14	0			
Attendance 154 days (1)	3	14	0			
Insurance	2	1	2	33	1	3
Net profit				£ 6	14	5
Net profit per head					19	3
Cost of production of 1 cwt. of live weight				£ 2	8*s*	0*d*

It follows from this experiment that from an economic point of view there is not much difference between the use of the automatic feeder and that of the common trough. For undermanned farms the automatic feeder might be recommended.

1271 – **The Value of Potatoes as a Principal Pig Food.** — Lehmann in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 361-397. Berlin, July 21, 1913.

The writer enumerates the causes which have led to a change in the method of fattening pigs. He gives an account of the fattening experiments he made at the Göttingen Experiment Station with the object of finding out a paying system based on the use of potatoes as the chief ration. The pigs were given as a basal ration 2.2 lbs. of chick peas ("Gramerbsen") and 0.22 lbs. of fish meal.

The feeds for comparison, maize in experiment I, and potatoes in experiments II, III and IV, were fed in as large quantities as the animals could consume. As their need of food increased, a larger amount of the feeds to be compared was given to the pigs. A little lime was also added during the first weeks of the experiment. In experiment II the animals were allowed from the first day to eat as many potatoes as they could. In experiments III and IV, on the contrary, the potatoes were fed during the two first four-weekly periods according to the weight of the pigs. During this time, the latter were also given a little rye chaff; in experiment IV meat meal was substituted for this from the third weekly period. Experiment I was a test of corn or maize feeding, experiment II a test of rapid fattening on potatoes; in experiment III the pigs were fattened on potatoes after a preliminary period, while in experiment IV they were fattened on potatoes after a preliminary course of meat meal. The experiments fell into 4 × 2 = 8 divisions. Nos. 1,6 and 8 began with 6 and ended with 5 pigs; Nos. 2, 3 and 5 began and ended with 6 and Nos. 4 and 7 with 5 pigs. The animals were of selected native breeds and weighed as follows according to the divisions: 1 = 46.0 lbs.; 2 = 46.6 lbs.; 3 = 49.1 lbs.; 4 = 50.6 lbs.; 5 = 46.4 lbs.; 6 = 46.0 lbs.; 7 = 43.1 lbs.; 8 = 46.2 lbs.

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(1) This item is ¼ d higher per day and per head than in lot I on account of the greater amount of attendance this lot required.

The pigs were fattened until they each attained the weight of from 231 to 242 lbs., which necessitated 5 ½ four-weekly periods. The final weights and the increase in the four experiments are given in Table I.

TABLE I.

		Final weight in lbs.						Increase in weight per pig lbs.
Pig		1	2	3	4	5	6	
Experiment I	Lot 1	253.0	264.0	283.1	218.9	201.1	—	187.22
	» 2	280.5	172.5	326.0	341.7	179.3	126.3	
» II	» 3	213.0	217.1	192.3	270.4	214.3	173.8	168.08
	» 4	229.4	192.5	246.2	227.9	217.6	—	
» III	» 5	238.3	254.4	275.2	256.5	268.8	153.3	187.22
	» 6	234.7	231.0	178.6	258.9	212.3	—	
» IV	» 7	251.2	244.2	229.2	227.5	213.0	—	188.54
	» 8	171.8	231.0	265.1	245.5	238.0	—	

The animals fed on maize and those given potatoes thus developed differently; this the writer attributes to inequality in appetite.

On an average the latter were more uniform in size and larger than the former.

The weights in pounds of maize and potatoes consumed per head per day are given in Table II.

TABLE II.

	I Maize fattening	II Rapid fattening with potatoes	III Potatoes (with preliminary fattening) without meat meal	IV Potatoes (with preliminary fattening) with meat meal
1 (Period of four weeks)	0.73	5.37	1.21	1.28
2 » » » »	0.86	5.08	1.83	1.74
3 » » » »	2.09	7.79	9.86	9.99
4 » » » »	2.86	11.07	14.54	12.23
5 » » » »	4.18	15.09	18.17	15.03
6 » » » »	5.37	16.65	21.45	18.55

In all the experiments, therefore, the pigs were able to consume more food in proportion as they became older. This increase, however, showed itself sooner in the case of the maize-fed animals and proceeded with more regularity than in that of the pigs fed on potatoes, which, as is shown by experiment II, only consumed an appreciably larger quantity of potatoes for the third four-weekly period. In experiment VI considerably fewer potatoes were eaten than in experiment III, no doubt owing to the meat meal given, which appears to diminish the power of potato consumption.

The total quantity of nutritive substances and of pure protein consumed and the increase in weight per head per day are given in pounds in Table III.

Table III.

	Total of nutritive substances	Pure protein	Total increase in weight	Amount of total food used for 100 parts of increased weight
Expt. I.	3.61	0.581	1.214	296
» II.	3.63	0.451	1.091	332
» III.	3.74	0.458	1.217	308
» IV.	3.63	0.546	1.217	296

The potatoes therefore supplied the pigs fattened on them with as large an amount of total nutritive substance as maize when used as a fattening ration. The latter, however, produced more increase in weight because it has a higher pure protein content. Pigs fattened on potatoes with a preliminary period attained the same weight as those fed on maize, in spite of the lower protein content. The reason for this in experiment III was, probably, the increased power of hydrocarbon assimilation consequent upon the good fattening preparation, while in experiment IV the meat meal had produced an increase in the protein content of the potato ration.

Consequently, the latter method must be superior to the first, seeing that it entails no increase in the total amount of the food rations, but only a change in the proportion of nutritive substances. The different values of the several experiments are clearly shown by Table IV, in which the profits are worked out per pig.

	Gross Profit			Net Profit	
	£	s	d	s	d
In fattening on maize	1	7	3¾	10	5½
» rapid fattening on potatoes	1	3	7½	6	9½
» fattening on potatoes after preliminary period . .	1	10	8¼	13	10
» fattening on potatoes + 0.22 lbs. meatmeal after preliminary period	1	11	5¾	14	6

It is thus shown by the experiments that rapid fattening is much less profitable than the other systems of fattening with potatoes, or than fattening on maize. Fattening with potatoes with a preliminary period, during which meat meal may or may not be fed, is, however, far superior to fattening on maize. There are therefore methods of fattening with potatoes as a principal ration which are as efficacious as those based upon the use of maize.

POULTRY

1272 – **Methods of Fattening, Dressing and Marketing Poultry.** — MITCHELL, R. V. in *Monthly Bulletin of the Missouri State Board of Agriculture*, Vol. XI, No. 2, pp. 4-32. Columbia, Mo., February 1913.

The good points in a suitable table bird are: 1) a well shaped body, *i. e.* long and deep, with back and breast broad, legs short and well set apart; 2) good health; and 3) the ability to stand forced feeding in close confinement. Birds of this type should be selected from the flock and mated with similarly well-shaped male birds so as to build up a strain of reliable pedigree.

One of the most popular breeds of farm chickens is the Barred Plymouth Rock, a strong hardy bird laying as many eggs as any of the general purpose breeds. Birds with yellow skin and shanks are preferred in the best markets.

Young birds that have been allowed free range are not in good market condition, but having good body frames, they respond to feeding very quickly and will gain in weight from 25 to 40 per cent. in two weeks time if properly cared for. The writer carried out experiments on different rations at the Pennsylvania Experiment Station during the fall of 1911, with the following results:

1. Birds fed on corn meal and meat scrap moistened with water gained in weight twice as much as birds fed on shelled corn and meat scraps.

2. The addition of wheat to a diet of shelled corn and meat (maize) reduced the increase in weight.

3. Birds fed on corn meal and buttermilk and kept in a fattening crate gained in weight three times as much as birds feds on corn meal alone, and this gain was made at a cost of about 3 ½ *d* (7 cents) for each pound gained, whilst the cost of the gains of the birds fed on whole grain ranged from 1*s* 3*d* to 2*s* 6*d* (30 to 60 cents) for each pound gained.

These results prove that whole grain does not fatten chickens and that the best results are obtained by feeding finely ground feeds to birds confined in crates.

The writer describes a fattening crate and method of constructing it. The birds are placed in the crate 24 hours before receiving their first feed. Food is given sparingly at first to enable the birds to stand up better under the heavy feeding to follow. They are allowed to eat as much as possible, 20 minutes usually being sufficient time. Regularity and cleanliness are essential in maintaining the birds in good condition.

The feed should be finely ground. An excellent fattening ration consists of the following:

24 lbs. of white bolted (sifted) corn meal.
6 lbs. of low-grade flour, or good-grade of wheat middlings.
4 lbs. of pea meal, or finely ground hulled oats.

One pound of the dry mixture is mixed with two pounds of buttermilk to form a thin butter that will pour out of a bucket. Sour milk may take the place of butter milk, or 15 per cent. of meat scrap may be added to the mixture if water is used. No grit, green food or water should be given to crate-fattening birds and the process should not extend beyond the second week.

The writer experimented with different rations on birds ed in crates during the fall of 1910 at the poultry department of Cornell University.

The rations were made up as follows:

Pens 1 *and* 2:

24 lbs. of white bolted corn meal
6 lbs. of low-grade flour
1 lb. of oatmeal
1 lb. of pea meal
1 lb. of buckwheat middlings
1 lb. of wheat middlings.

Pens 3 *and* 4:

12 lbs. of white bolted corn meal
4 lbs. of low-grade flour
6 lbs. of oatmeal
6 lbs. of pea meal
4 lbs. of buckwheat middlings
2 lbs. of wheat middlings.

Pens 5 *and* 6:

1 lb. of white bolted corn meal
1 lb. of low-grade flour
10 lbs. of oatmeal
10 lbs. of pea meal
8 lbs. of buckwheat middlings
4 lbs. of wheat middlings.

All these rations were mixed in the buttermilk to the consistency of butter. The birds were fed three times a day (at sunrise, 11.30, and 4.30) for a fortnight. Their appetites were good, except one bird in each of pens 1 and 4 and two birds in pen 5.

The results obtained are shown in Table I.

The amount of feed consumed by the birds in each pen varied slightly. Two birds were removed from pen No. 1. during the experiment and were not reckoned in the per cent.gain. The birds in pens 1 and 2 made the best gain, those in 3 and 4 the next best, and in 5 and 6 the least gain. The gains are in proportion to the amount of the rations.

The birds in pens 1 and 2 had the best appearance. They were well filled out, creamy white in colour, with the fat well distributed over the body. The birds in pens 5 and 6 had wrinkled skins and poor colour and had little fat distributed over the body. When drawn the entrails and gizard showed practically no fat.

The writer describes the methods of killing and cleaning poultry. Effective bleeding is obtained by inserting a knife into the bird's mouth on the left side of the neck and giving a downward diagonal cut which severs the two main blood vessels in the neck. By piercing the brain in the centre of the head a little behind the eyes the muscles of the skin will relax and the feathers can be pulled out easily.

For encouraging the better marketing of poultry, the writer recommends organisation of the producers to ensure better market prices and adds as an appendix a copy of the constitution and by-laws of one of these organizations, taken from *Bulletin* No. 208 of the Ontario Department of Agriculture

TABLE I. — (*weight in lbs.*)

Pen	At beginning	At end of 1st week	At end of 2nd week	Before killing	Dressed	Total gain	% gain	Total of feed
1	22.9	27.9	30.3	28.75	25.75	7.4	32.4	Grain . . . . 25.7 B. Milk. 51.4
2	30.8	36.25	38.5	36.25	32.5	7.7	25.2	Grain . . . . 26.35 B. Milk. 52.70
3	30.85	37.35	38.4	36.4	32.45	7.55	24.4	Grain . . . . 25.25 B. Milk. 63.12
4	31.25	37.05	39.65	37.22	33.5	8.4	26.5	Grain . . . . 26.6 B. Milk. 66.5
5	31.0	35.75	37.95	35.32	31.1	7.0	22.5	Grain . . . . 25.6 B. Milk. 76.8
6	31.1	35.75	37.35	34.95	31.5	6.3	20.2	Grain . . . . 22.5 B. Milk. 67.5

1273 – **Results of the Season 1912-13 of the Service for the Control of Silkworm Egg Breeding in France.** — *Bulletin mensuel de l'Office de Renseignements Agricoles*, Year 12, No. 7, p. 759 Paris, July 1913.

SILKWORMS

The service of Control of Silkworm Egg Breeding created by decree of April 26, 1907, with the object of assuring the freedom of the eggs from disease (both for home use and for exportation to countries which require guarantees in this respect) has carried on its work during the season 1912-13.

Two inspectors, directors of the sericulture stations of Draguignar and Alais respectively, and eleven controllers have been employed in the work.

The number of establishments inspected was 88, and the reports show that distinct improvements have been effected as much in the selection for breeding purposes as for the quality of the cocoons.

From 497 666 lbs. of selected cocoons, 34 645 lbs. of egg swere obtained. The number of cases certified by the Service reached 537 575, containing a total of 23 893 lbs.

The number of batches of eggs sampled in the rearing establishments and examined at the stations of Draguignan and Alais totalled 2749, of which only 16 were found to be diseased .This result shows how carefully the batches attacked by pébrine had been removed by the egg-breeders and the controllers of the Service.

1274 - The Stickleback, a Source of Danger in Fish-Breeding. — Mitteil. der Kgl. Bayer. Biolog. Versuchssation für Fischerei in München, in *Allgemeine Fischerei-Zeitung*, Year 38, No. 17, pp. 441-442. Munich, September 1, 1913.

The two species of stickleback occurring in Germany, *Gasterosteus aculeatus* and *G. pungitius*, are often attacked by *Nosema anumalum*, a parasite belonging to the sporozoa. The seat of the infection is usually the exterior wall of the body, on which white tumours, often as large as peas, but not malignant in character, sometimes appear in such numbers as to give the fish the appearance of being encrusted with pearls. The parasite may, however, penetrate into the internal organs, and notably the ovary, where it is no longer harmless.

According to Dr. Kunt (Norway), *Nosema* also occurs on sea-trout and plays a conspicuous part in the troubles of the Piscicultural Institute at Laerdal. Here it has been exclusively found in the ovaries of its victims. The parasite penetrates into the eggs and destroys them. In the coast region of West Sweden gudgeon (*Gobius niger*) has been attacked by *Nosema* and the egg-production of this fish has been affected. The parasite has not yet been found in artificially bred fish in Germany. The systematic destruction of the sticklebacks' nests is recommended as the best method of preventing infection.

The article contains an illustration showing a stickleback covered with *Nosema* tumours.

1275 - Contribution to the Study of Furunculosis, especially with regard to the Salmonidae. — Hulsow, Karl in *Allgemeine Fischerei-Zeitung*, Year 38, No. 10, pp. 250-253; No. 18, pp. 458-463. Munich, May 15 and September 15, 1913.

Furunculosis, which chiefly occurs among the Salmonidae, is an infectious disease caused by a specific bacterium, *Bact. salmonicida*. It is usually characterised by the presence in the muscles of furuncles containing blood and pus. These are, however, often absent, and the intestine becomes inflamed and bloody infiltrated patches make their appearance on the organs. The typical form of furunculosis is a general infection of the blood, having its origin in the intestine. The furuncles always make their first appearance after an inflammation of the intestine. Death frequently occurs before the formation of furuncles and often even previous to the appearance of the bacteria in the blood. In the latter case, the bacteria remain exclusively in the intestine. The writer gives the name of intestinal furunculosis to this form of the disease, the fatal ending of which is due without doubt to the bacterial toxins making their way into the blood. He also distinguishes a latent form of furunculosis, in which the bacteria are present in the intestine of the fish but have no effect upon its health.

It is not known why the disease appears under different forms. Perhaps there are several species, or varieties, of the bacteria, differing from one another in the effects they produce on the fish. The increased virulence of the same bacterium might, however, account for the phenomenon. The greater toxic action probably also plays a part in the varying severity of disease; thus in open waters sometimes few fish die, while on other occasions almost the whole stock is carried off. The various forms of furunculosis may also depend upon the different behaviour of the fish towards the bacteria.

This is probable from the facts that the fry are immune to the attacks of the furunculosis bacteria, and that one-year-old fish in open waters are fairly immune to the natural occurrence of the disease, and do not easily contract it when inoculated. This fact renders it probable that young fish have the power of rendering the invading bacteria innocuous, and therefore possess a certain degree of immunity against furunculosis.

For the control of the latter, the writer recommends, as a result of his investigations at the Experiment Station at Munich, the removal from the water of all dead or infected fish, when it is a case of open waters. Unless this precaution is taken the diseased fish continue to liberate spores into the water, and the dead victims, especially when they decay, form excellent breeding places for the bacteria. All implements which have been used in infected waters should after use be dipped each time in lime water, or a solution of permanganate (1 : 100 000), or else disinfected by having boiling water poured over them. If furunculosis breaks out so violently that the whole stock is in danger, it is advisable to remove all the fish from the water. The writer recommends permanganate in a solution of 1 : 100 000 for the disinfection of the breeding ponds.

The spore content of the water is first ascertained, then the required amount of the salt is dissolved in water, and poured into the pond. A pond with 62 550 spores per c.c., when thus treated by the writer, was found after one hour's time to contain only 98 spores. After 24 hours had elapsed, the number of spores per c.c. had increased to 3830, and in two days to 12 580.

The samples for counting were always taken from different depths and spots, and show that it is possible to obtain an equal distribution of the salt. This method is only suitable to use in the case of ponds from which the fish have been removed. The writer recommends a 1 : 150 000 solution of the salt for the destruction of bacteria in ponds stocked with fish. In both cases it is necessary to repeat the disinfection at 2 to 3 days' interval.

1276 – **Manuring Experiments on Fish Ponds.** NERESHEIMER in *Monatshefte für Landwirtschaft*, Year 6, Part 8, pp. 225-238. Vienna, August 1913.

The writer criticizes the experiments made by Kühnert-Preets on the manuring of fish ponds in Schleswig-Holstein (1) and refutes his results.

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(1) Published in *Fischerei-Zeitung*, Vol. 16, No. 26, pp. 323-329. Neudamm, June 29, 1913. (*Ed.*).

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

1277 – **Development and Present State of Agricultural Machinery.** — FISCHER, G. in *Zeitschrift des Vereines Deutscher Ingenieure*, Vol. 57, Nos. 30, 31 and 32, pp. 1165-1169, 1212-1218 and 1263-1268. Berlin, July 26, August 2 and 9, 1913.

The development of agricultural machinery did not arise in consequence of the demand on the part of farmers for better implements or for machinery. The first steps are almost exclusively due to the machine industry itself. Technical progress and social and economic changes induced farmers to use machines. The writer treats in his paper only of such groups of machines as deserve special mention either for their importance or for the technically successful way in which the problem set before them has been solved.

The oldest form of drilling machine was in two separate parts, the first of which was a one-horse two-wheeled chariot, which by means of shares opened six furrows; the other part which followed was the seeder, also on wheels, which was pushed by a man. A great improvement on this was the English drilling machine invented by James Cooke and unmistakeably the forerunner of modern drills. The seedbox is broad, the seeding shaft which raises the seed by means of small scoops is driven by an intermediate shaft, and the seed falls through funnel-shaped tubes into the hollow shares that open the furrows. The most recent drills differ from Cooke's in the steerable fore-carriage and in the jointed lever to which the hollow shares are fastened; thus every share can follow the inequalities of the soil, while the steering of the fore-carriage facilitates the straight running of the machine and consequently the straightness of the rows.

The writer points out the difficulties which have still to be overcome in the construction of a good drill and proceeds to discuss the development of manure spreaders. These resemble drills in some points, but present still greater difficulties as they have to deal with the most various kinds of manures. One of the simplest and oldest forms is that in which the hopper has a slit in its bottom through which a stirring shaft pushes the manure. By adjusting the breadth of the slit the quantity of manure spread can be regulated. At present the most commonly used manure spreader is the chain spreader, in which the slit is not in the bottom but in the back of the hopper, so that the manure cannot fall out by itself.

The demand for a reaping machine is very ancient. The invention of a practical reaping apparatus instead of harvesting by hand consisted in the introduction of the principle of shearing, upon which Meare's hand machine was patented in 1800. In 1807 Salmon invented a hand reaper with several scissors placed side by side so that no haulm could escape. Patrick Bell in 1826 constructed a practical machine, in which the cutter bar was situated in front of the reaper which was pushed by horses harnessed behind it; another important feature was a reel that beat the grain down against the blades and platform attached. The further improvement of the cutting apparatus was due to Americans, chiefly to Obed Hussey and

Cyrus Mc Cormick, whose works still occupy one of the foremost positions. At the same time, both in England and in America, innumerable devices

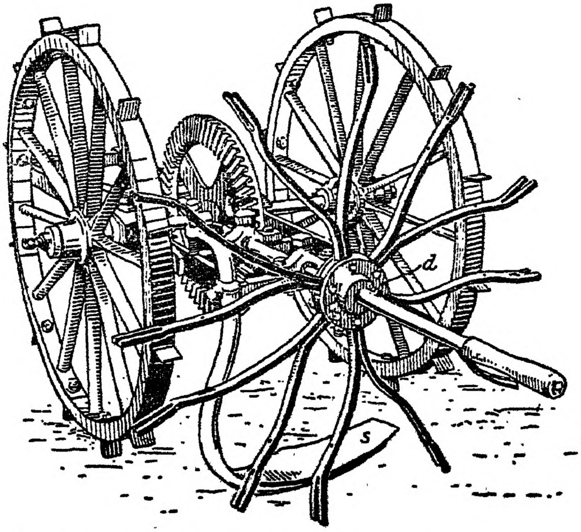


Fig. 1. — Hanson-Münster potato digger.

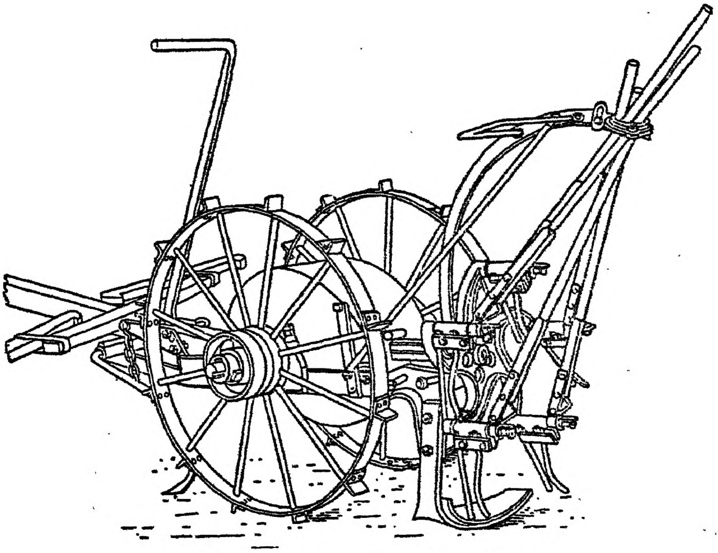


Fig. 2. — Harder's potato digger.

were invented with the object of improving the apparatus for discharging the cut crop, among which Robinson's invention of rakes revolving around an inclined axis was one of the best. Shortly after, these rakes were made with articulated joints and caused to revolve on a cam as at present used.

As for binders, in one of the earliest of these machines a wire was carried by a needle arm round the sheaf and then simply twisted into a knot. But binding with wire has the inconvenience of easily allowing bits of wire to remain in the straw. In recent binders the knives are as usual arranged on the shearing principle, and each end of the cutter bar is provided with dividers, of which the most important one is the outside one which separates the wheat to be reaped from that still left standing.

In the development of hay rakes the only noteworthy feature is the gradual decrease of weight due to the improvement of the material with which they are made, and the greater facility of lifting the teeth by utilizing the weight of the driver.

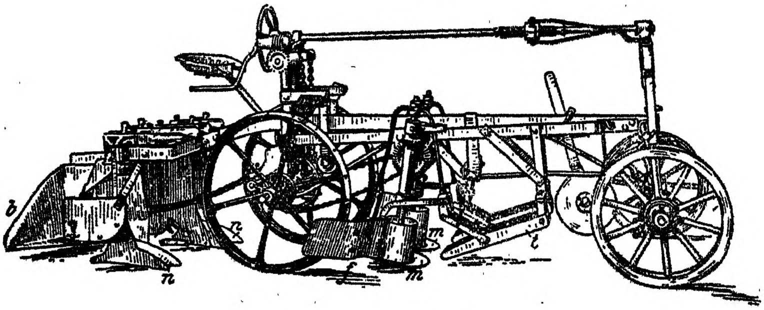


Fig. 3. — Siederslebeu & Co's beetroot-lifter.

For harvesting roots and tubers the difficulties in devising were much greater than in the case of cereals. The best machines of this kind are those derived from Count Münsters' improvement of the Englishman Hanson's machine. Fig. 1 shows the Hanson Münster machine, now out of date, but from which George Harder's potato digger has been developed (Fig. 2). The forks are no longer fastened directly to the throw-wheel but by means of joints. The beet-lifter with topping apparatus, shown in Fig. 3, which works quite well under fairly difficult conditions, has been built during recent years by Siedersleben and Co. of Bernburg.

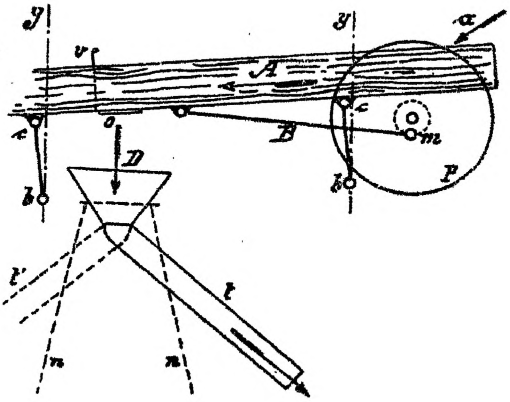
The first threshing machines were of the most varied types. Cylinders, pestles and beaters attempted to imitate the work of the flail, but only the invention of the concave with revolving drum gave a truly efficient machine. The writer describes the barred-drum threshing machine invented by Andrew Meikle in Scotland in 1780. His bars were provided with projecting teeth. In America toothed bars are generally used, while in Europe their use is limited to small machines, because they break up the straw and diminish its value. Retaining Meickle's drum, threshing machines have been much improved by the introduction of more efficient shakers, riddles, screens, etc. They were soon mounted on wheels, like the portable engines, so as to be easily moved as required. A large up-to-date threshing machine with all the recent improvements can easily turn out 1100 to 1300 bushels of clean wheat per day. The writer describes a modern threshing outfit and gives some important details of threshers, after which he reviews some straw presses.

Straw presses have been used in North America since the middle of last century. In Germany the want of them was not felt till much later and only in the nineties did they begin to spread in consequence of the demand for straw for paper mills and other industries, while at the same time straw was produced in excess of the requirements of the farms.

After a description and illustration of some apparatus for loading and transporting for agricultural purposes, the writer considers the most discussed question in the matter of agricultural machinery, namely that of mechanical tillage, and concludes his paper by remarks on the economic importance of machinery for agriculture, industry and foreign trade.

1278 – **Transport of Grain in Granaries.** — RINGELMANN, M. in *Journal d'Agriculture Pratique*, Year 77, Vol. 2, No. 38, pp. 366-368. Paris, September 18, 1913.

This simple and cheap device consists, as may be seen from the accompanying figure, of a wooden channel which can be subjected to a swinging motion.



Device for the transport of grain in granaries.

The grain which is raised by an elevator falls in (*a*) into the wooden channel which consists of a bottom and two upright sides. This channel is attached high up to the roof of the granary and runs along its whole length; it is only very slightly inclined and is supported in (*b*) on articulated frames (*bc*) which can move to and fro. The supports (*y*) are fastened to the roof beams and carry the bearings (*b*). At the upper end of the channel a long wooden connecting rod is attached, the other extremity of which is fastened to a crank which revolves by means of the pulley (*P*). In the bottom board of the channel there are several openings (*o*) closed by slides. Partitions (*v*) are used to close the channel when the slide (*o*) is opened. Under the opening a hopper (*D*) with an inclined zinc pipe (*t*) is placed to receive the grain falling through (*o*) and to lead it where required in the granary.

In the second part of his paper the writer, together with two illustrations of such a device existing at Norville (Seine-et-Oise, France) gives its dimensions, of which the following are the principal.

Length of channel	83 feet
Breadth	6.4 inches
Depth	6.4 »
Inclination	8 per 1000
Extent of swing	6 inches
Revolutions per minute	120

1279 - **Trial of a Draught Regulator for Winnowers.** — (Report of the Machine Testing Station of the Agricultural Association for Rhenish Prussia). — GIESSLER in *Deutsche Landwirtschaftliche Presse*, Year 40, No 74, p. 882. Berlin, September 13, 1913.

The uniformity of speed of the draught of winnowing machines, especially those driven by hand, is only approximately attained; for this reason application of a wind regulator, which, within certain limits, almost completely does away with the effect of the inconstant number of revolutions, is to be considered as a useful improvement, all the more so as it increases the price of the winnower by only about 5 shillings.

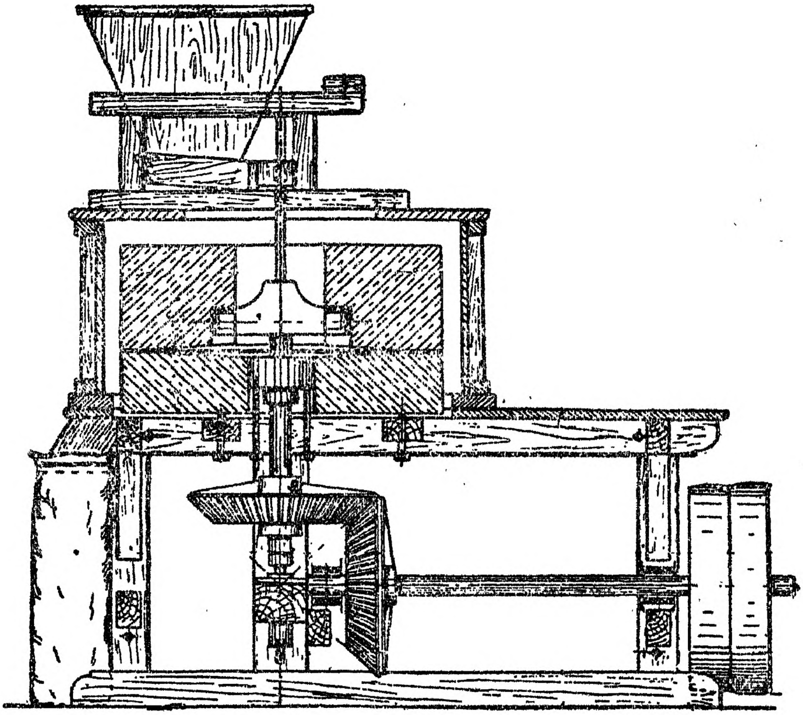
The writer, after describing the apparatus and its working, reports upon the experiments and their results, according to which the greatest deviations from the wind velocity obtained by 46 revolutions per minute were as follows:

Revolutions of crank handle per minute	A. Entrance of air completely open		B. Entrance of air partially closed	
	Wind valve always closed	Wind valve worked by regulator	Wind valve always closed	wind valve worked by regulator
from 42 to 46	0.58	0.42	0.37	0.08
from 46 to 50	0.58	0.00	0.37	0.07
Average.	0.58	0.21	0.37	0.075

The deviations in the velocity of the wind at 42 to 50 revolutions per minute can thus be reduced by the regulator by from 0.58 : 0.21 = 2.75, to 0.37 : 0.075 = 49.

1280 - **Trial of a Groat Mill.** — WOTRUBA, R. in *Maschinen-Zeitung*, Year 11, No. 18, pp. 217-219 Berlin, September 15, 1913.

The mill stones of the groat mill shown in the accompanying figure are 3ft. 3 in. in diameter.



Molino triturador de muelas.

On trial the mill gave the following results:

Normal output per hour: 881 lbs.

Power required for running mill: 5.6 kilowatt per hour.

Power required for grinding 110 lbs.: 0.7 kw. per hour.

Cost of energy re uired for grinding 110 lbs. at the rate of 2.34*d* per kilowatt-hour: 1.65*d*.

Power required at the driving pulley: 8 HP.

1281 - Milking Machines: their Sterilization and their Efficiency in producing Clean Milk.

— WING, LOIS W. in *Cornell University Agricultural Experiment Station, Circular* No. 18, pp. 65-74. Ithaca, New York, May 1913.

Milking machines are expected to deliver milk free from dirt and bacteria, but in practice this result is not possible without considerable attention to the cleaning and sterilisation of the machine.

The present experiments were arranged to test: 1) the efficiency of machines in producing a high grade of milk, and 2) the amount of care necessary to keep the machines in a sterile condition.

The first experiments were conducted at a laboratory and a farm near Little Falls, New York, in 1911. The stable was whitewashed and had a plank floor, whilst the feeding alleys, mangers and gutter were of cement. No unusual care was given in keeping the stable and cows clean. The machines used throughout the experiment were the Burrell-Lawrence- Kennedy cow-milkers.

The sterilization was carried out by various methods, using brine, alcohol, hydrogen peroxide, potassium permanganate, copper sulphate, acetic acid, and hot water as germicides. Samples of milk were taken for bacterial counts each night.

As a result of the experiments the writer concludes:

1. — Brine solution, as generally used for the treatment of rubber tubes and teat-cups, does not keep them in a sterile condition.

2. — Although the milking machine excludes external contamination to a marked degree, the milk may still have a high bacteria count owing to contamination in the tubes.

3. — The rubber tubes and teat-cups may be kept in a practically sterile condition by the use of a salt solution containing chloride of lime.

4. — The chloride of lime solution should be made fresh at frequent intervals to effect complete sterilization.

5. — If the machines are kept in a sterile condition, it is possible to obtain milk with low bacteria count.

1282 - Trial of a Small Steam Cream-Pasteurizer.

(Report of the Dairy Institute at Proskau). — KLEIN in *Molkerei Zeitung*, Year 23, No. 31, p. 366. Berlin, August 2, 1913.

This pasteurizer is horizontal and is of very simple construction. The cylinder, which is of copper and is provided with a stirrer, measures only 7 inches in diameter and 10 ½ inches in length and is surrounded by an iron steam-jacket.

During the trial sixteen separate tests were made during which the cream to be converted into butter and containing an average of 24.1 per cent. of butter-fat was heated to about 75° C. After cooling it was acidified with Moser's pure cultures and churned. The fat content of the cream and of the buttermilk were carefully determined each time in order to ascertain the yield in butter. The same determinations were made on the samples of unpasteurized milk used as control.

The result of the trial was favourable ; the pasteurizer worked satisfactorily without imparting any taste of cooked or burnt milk to the butter. An average of 17 ½ gallons per hour passed through the pasteurizer. The average time required to make the butter from the pasteurized cream was five minutes longer than for the unheated samples. The yield in butter was 97.7 per cent. for the pasteurized cream and 97.5 per cent. for the other cream.

On the whole this pasteurizer seems well adapted to bring the pasteurizing of cream within the reach of the smallest steam dairy.

1283 – **A Handy Feed Hopper.** — Ott, E. A. in *The Country Gentleman*, Vol. 78, No. 37, p. 1341. Philadelphia, September 13, 1913.

The writer describes a hopper in use at Fort Collins, Colorado, for feeding charcoal, grit-oyster shell and mash. Its advantages are that it feeds the birds in two different pens without taking up extra space, is economical and easy to construct, and does not become clogged in use. Fig. 1. shows a section of the device with the boards slanting at the bottom to allow the feed to escape easily and to prevent its remaining in the centre of the device and spoiling. Fig. 2 shows the device in position and its suitability for low houses and filling with food from the outside without entering the pen.

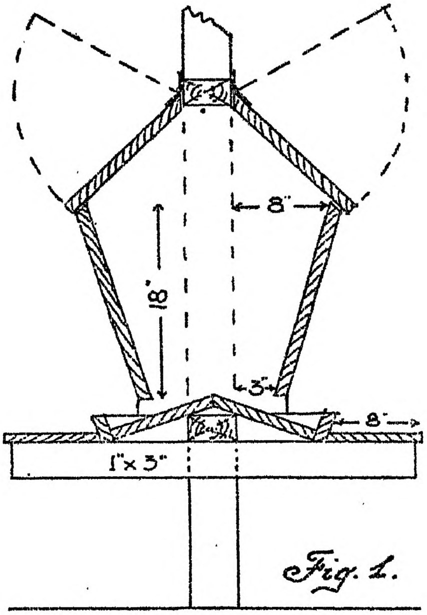


Fig. 1.

Section of hopper.

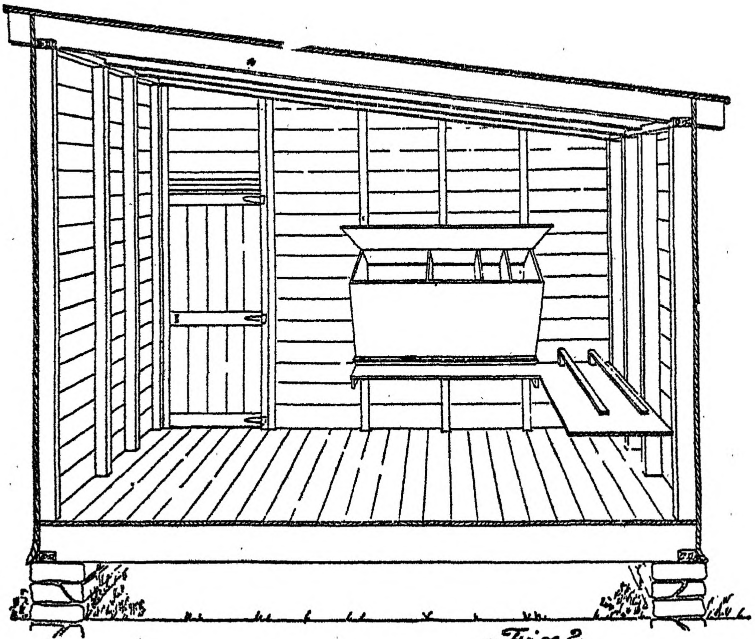


Fig. 2.

Position of hopper in fowl-house.

1284 - Review of Patents.

Tillage implements and machines.

264 196 (Germany). Apparatus for applying a subsoiler to the side of a frame plough, with differential wheel adjustment.
264 336 (Germany). Turn-wrest plough with revolving beam.
264 716 (Germany). Tractor for interchangeable agricultural implements.
61 002 (Austria). Tilling machine with drum-shaped implement carrier.
59 891 (Hungary). Apparatus for two-engine ploughing.
60 216 (Hungary). Motor-plough.
59 806 (Hungary). Cultivator plough.
1 069 835 (United States). Reversible plough.
1 069 875 (United States). Tractor.
1 070 362 (United States). Traction-engine.
1 070 281 (United States). Cultivator.
456 337 (France). Improvement in vineyard ploughs.
456 670 (France). Motor spader.
456 914 (France). Improvements in ploughs with fore-carriage.
11 949 (England). Motor plough.
130 979 (Italy). Ploughing machine.
61 334. (Switzerland). Plough.
61 847 (Switzerland). Plough with apparatus for planting potatoes.

Manure distributors.

264 323 (Germany). Chemical manure distributor with throw wheel.
265 651 (Germany). Cylinder manure distributor.
60 270 (Hungary). Manure distributor with sowing apparatus.

Drills.

263 956 (Germany). Drill with distributing wheels in seed hopper.
59 899 (Hungary). Potato-planting machine.
1 070 898 (United States). Potato-planter.
455 956 (France). Improvements in drills.
12 058 (England). Seed drills.

Reapers and mowers.

264 717 (Germany). Automatic ungearing device for mowers.
60 998 (Austria). Mower.
1 070 055 (United States). Mowing machine.
1 069 705 (United States). Mowing attachment for motor vehicles.
457 128 (France). Improvements in mowers.
457 329 (France). Mower with reaping attachment.
11 573 (England). Mowing machines.
133 303 (Italy). Application of motors to mowers.

Machines for lifting root crops.

264 197 (Germany). Apparatus for lifting potatoes while ploughing.
60 239 (Hungary). Potato-lifting machine.
456 491 (France). Potato-lifting machine.
61 130 (Switzerland). Throw-wheel for potato-lifting machine.

Threshing and winnowing machines.

61 013 (Austria). Grain-cleaning machine.
457 419 (France). Automatic feeder for threshing machines.
12 280 (England). Threshing machine.

Other agricultural machines and implements.

264 439 (Germany). Grubber.
264 719 (Germany). Pea-sorting machine.
61 559 (Austria). Chaff cutter.
59 901 (Hungary). Root cutter.
1 070 346 (United States). Machine for cutting sugar cane.
1 070 830 (United States). Insect exterminator.
456 353 (France). Device for milking-machines.
455 983 (France). Sprayer.
12 987 (England). Elevators.
130 970 (Italy). Esiccator for rice, maize, wine pomace and the like.
133 308 (Italy). Continuous rotary press for citrus fruits.
61 628 (Switzerland). Continuous fruit press.

BUILDING-CONSTRUCTION

1285 - A Practical Flooring for Pigsties. (1). — MÜLLER VON BERNECK in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 18, pp. 363-365. Berlin, September 15, 1913.

The flooring for pigsties shown in the accompanying figure is but slightly sloping; it is surrounded by a small gutter which issues by the door into the main gutter. Round two sides of this flooring on which the animals lie there is a belt 16 to 20 inches wide, for their droppings, which is more inclined than the rest of the floor and is formed of ribbed cement. The inclination of this belt is 25 to 27 in 100, while that of the rest of the stall is only 2.25 in 100. The liquid excrements run off into the gutter, while the solids remain and are moved every day or every other day. The centre of the sty des not get wet and the litter keeps in good condition some days longer than in other sties, and the animals have a dry bed. The bars which are frequently placed along the walls for the protection of the suckling pigs are not required in this sty, as the sow never lies on the inclined surface. As the figure shows, the sty is part of a swine shed. It is 9ft. 1 in. by 6ft. 3 in., and is sufficient for four fattening pigs. The front abutting on the passage consists of a pivoting trough 4 feet long with an iron railing over it, and a door 2ft. 2 in. wide. The cost of building such a sty is moderate.

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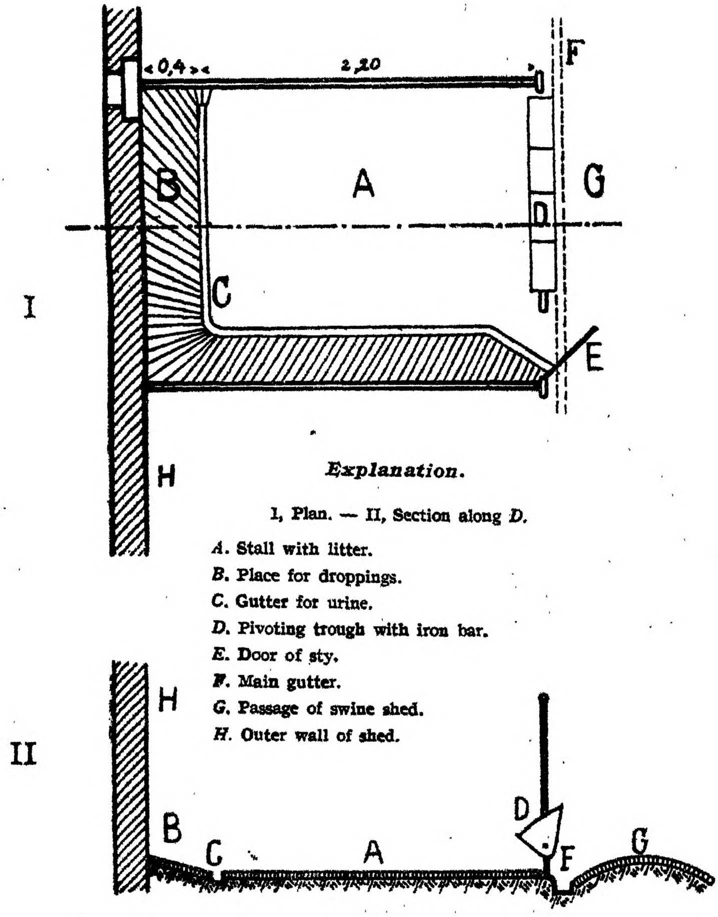
(1) See No. 405, *B.* April 1913. (*Ed.*).



Explanation.

I, Plan. — II, Section along *D.*

A. Stall with litter.
B. Place for droppings.
C. Gutter for urine.
D. Pivoting trough with iron bar.
E. Door of sty.
F. Main gutter.
G. Passage of swine shed.
H. Outer wall of shed.

Flooring for stye.

1286 - **Watering Place on Moor Pastures.** — HEISIG, I. in *Zeitschrift für Moorkultur und Torfverwertung*, Year XI, Part 3, pp. 87-93. Vienna, 1913.

In preparing the plan for a moor pasture the question of providing the grazing stock with a permanent supply of good fresh water is one of the first to be considered, and it may be solved by means of the springs that often arise on moors, by brooks or ponds or neighbouring lakes or by the water collected in the drainage ditches, the best way being always by a sufficient supply of running water.

If in a drainage scheme the main drainage ditch which collects also the water which formerly flowed through the moor as a small brook, traverses the moor pasture, it should be preferred to any other source for the watering place.

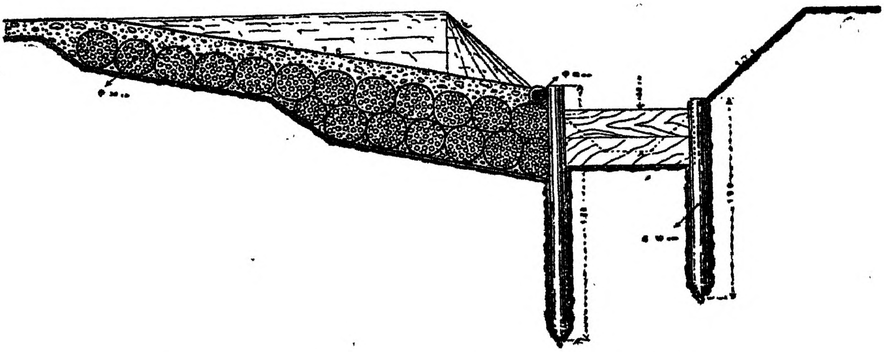


Fig. 1. — Section of watering place on secondary ditch.

This must be constructed so as to suit the special conditions of the moor soil as is shown by fig. 2, which represents the plan and section of a double watering place.

This watering place, which can be used also as a ford, is about 13 feet long. The descents to the bottom of the ditch have a slope of 1 in 5, thus affording the animals an easy and safe access to the running water. In order to prevent the treading down of the slope and the animals sinking in the moor soil, which is likely there to be especially soft, both the approaches and the bottom of the ditch are covered with 4-inch round timbers. The cost of such a double watering place, including material and labour, is about £10 10*s*.

If instead the drinking water is to be obtained from one of the secondary ditches which often supply sufficient and good water for the purpose, special arrangements are necessary. A simple, efficient and cheap watering place is shown in cross section in fig. 1, in which the water is held up by a small wooden weir (1).

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(1) Similar ditch watering places are discussed in *Mitteilungen des Vereins zur Förderung der Moorkultur in Deutschen Reiche*, 1911, No. 18, p. 393.

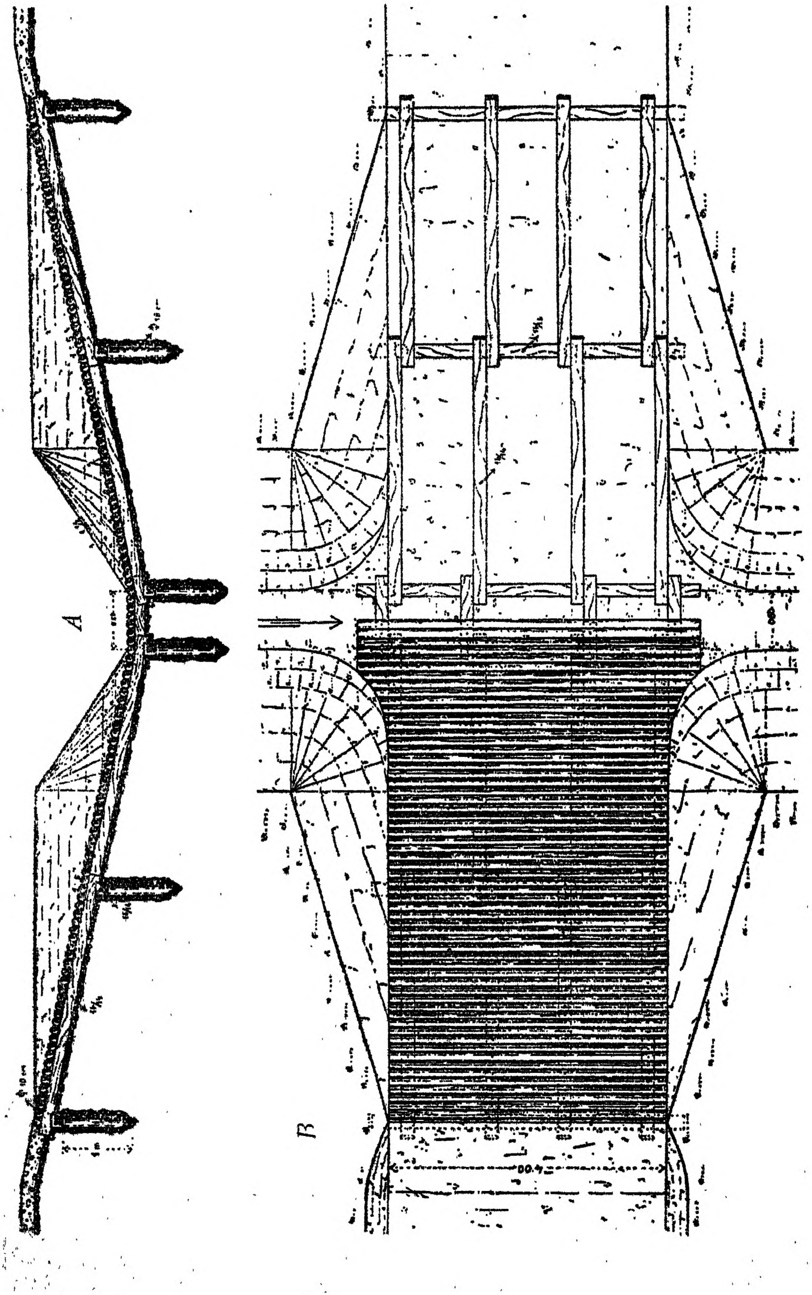

Fig. 2. — Double watering place: *A*, section; *B*, plan.

The cost of such a watering place is relatively low, about £2 10*s*.

If recourse must be had to spring water, a so-called "automatic waterer" is recommended; these are, however, not suitable for large herds, for which it is more advantageous to pump the water into the drinking troughs. Lastly, the writer mentions the enclosures connected with watering places and the arrangements for preventing the water being fouled.

RURAL ECONOMICS.

RURAL ECONOMICS.

1287 - **The Distribution of Capital in Fifty Peasant Farms in the Segeberg District in Schleswig-Holstein.** — HINRICHS in *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Year XXVIII, Part 33, pp. 512-517. Berlin, September 13, 1913.

The writer discusses in this paper the results of his investigations on the distribution of capital in 50 peasant farms in which the inventory of the assets was made at the same time (New Years' Day 1913) acording to the forms for peasant farms published by the Deutsche Landwirtschafts Gesellschaft under the name of "Vermögens nachweis für bäuerliche Betriebe". He gives some data on the climatic, economic and soil conditions of the district which are necessary for rightly judging the distribution of capital.

In most of the farms a light sandy soil prevails, only 13 disposing of a good loam. The very limited extension of hoed crops, the prevalence of cereals, the introduction of two or three years' grazing and of buckwheat (characteristic of the locality) into the rotation, as well as the still customary bare fallows, point to an extensive cultivation which does not require much circulating capital. The average extent of the farms examined is about 126 acres, of which an average of 86.2 per cent. is arable, 8 per cent. meadow, and 5.8 per cent. permanent pasture.

Of the total fixed capital, 75.2 per cent. represents the bare land, 0.4 per cent. the land improvements and 0.9 per cent the woods; while the value of the buildings amounts to 23.5 per cent. This ratio between land and buildings may be considered as fairly favourable. In some farms, however, the ratio is notably different. The greatest capital in buildings is 42.9 per cent. of the capital in land, the smallest only 11.8 per cent. On every acre of productive land there is an average capital of £10 3*s* 10*d* in buildings; in some farms this sinks to £3 19*s* 4*d* and in others it exceeds £20.

The total working capital per acre of productive area is £10 1*s* 10*d*, in which sum the cash in hand is not included. Of the above sum £6 16*s* represents the live stock, £1 10*s* 11*d* the dead stock and £1 14*s* 11*d* the implements. This working capital, which is rather small for modern conditions of farming, is an index of only a medium intensity of farming.

Of the total capital, the fixed capital is 81.4 per cent. (land 62.6, buildings 18.8) and working capital 18.6. The working capital is further subdivided as follows : live stock 67.6 per cent., machines and implements

15.2, and dead stock in kind 17.2. The ratio of percentage of these three kinds of capital to the total capital is 12.7, 2.7 and 3.2 .

The value of cattle is 59.6 per cent. (cows 41.9, other cattle 17.7) of the whole capital in live stock, thus revealing the importance of the dairy in these farms. Horses represent 20.6, pigs 19.6, and sheep 0.2 per cent. of the capital in live stock.

The capital in machines and implements is, in general, not high. Out of the whole inventory capital only 18 per cent. is the share of the dead stock, as against 82 per cent. of the live stock.

The ratio between the circulating capital and the fixed working capital is as 1 : 4.8. Although the cash in hand could not be included in the account, it may be said generally that in a good many cases the peasant farmers work with too small a circulating capital. Still, a sure and definite opinion on the economic suitableness of the distribution of capital in individual farms cannot be pronounced without the aid of careful book-keeping.

1288 – **The Cost of Big Farming.** — SHOCKNEY, DON P. in *The Country Gentleman*, Vol. 78, No. 37, pp. 1321-1322. Philadelphia, September 13, 1913.

The large farm owner in the South of the United States with the general system of renting in shares and with the present average crops about 20 bushels of maize or half a bale of cotton to the acre, gets no profit at all, but only losses. He rents his land in lots of 20 acres to each negro tenant family, who plant 14 acres to cotton and 6 to maize. The planter furnishes:

	$
Twenty acres of land worth $5 a year	100.00
Overseeing	60 —
Mule, its feed and care	150 —
Use of implements and harness	20 —
House rent	24 —
Fuel privileges	12 —
Pasturage for cows, pigs and ponies	24 —
Maintenance and overhead costs	40 —
Cotton seed	20 —
Seed corn	2 —
One half ginning, bagging and ties	9 —
Planter's cost, one half interest in 20-acre crop or $ 23.05 per acre	$461 —

The negro tenant furnishes:

	$
161 days common labour, cotton	161.00
21 days » » , maize	21 —
One half ginning, bagging and ties	9 —
Tenant's cost, one half interest in 20-acre crop	$191 —

The average returns are in normal years:

	$
7 bales of cotton, 525 lbs. each, at 11 cents a pound	404.25
3 ½ tons cotton seed at $ 20 a ton	70.00
120 bushels corn, at 70 cents a bushel	84.00
Total product. 20 acres	$558.25
Value of product per acre	$27.91

Cost per acre and per annum.

	Long staple cotton	Short staple cotton	Early corn cut and shredded	Late corn slip shucked	Oats and cow-peas two crops
	$	$	$	$	$
Machine tilling, and carting . .	10.30	10.30	10.67	9.31	8.05
Shredding fodder			4.00		
Threshing oats					2.00
» cow-peas					2.50
Baling hay or straw					7.50
» shredded fodder			4.00		
Ginning cotton, short staple . .		1.50			
» » long staple . .	2.00				
Hand labor, hoeing	3.00	3.00			
« » shocking maize . .			1.00		0.50
» » » oats . .					
Ricking cotton, short staple . .		5.40			
» » long staple . .	6.00				
Shucking corn.				1.25	
Çotton bagging and ties . . .	0.45	0.54			
Handling	0.10	0.12	1.00	0.50	1.00
Seed	2.00	1.00	0.50	0.50	2.50
Overseeing	3.00	3.00	1.80	1.50	1.50
Maintenance, fences, ditches, roads and buildings	2.00	2.00	2.00	2.00	2.00
Overhead-taxes, insurance and general expenses	2.00	2.00	2.00	2.00	2.00
Total cost per acre . . . $	30.85	28.86	26.97	16.96	20.55

The planter gets one half of this product, $ 13.95 per acre, and suffers thus a direct loss of $ 23.05 - 13.95 = $ 9.10 per acre.

According to the writer no farmer or corporation of farmers could succeed in inducing negro tenants to increase the per-acre yield to a point where the landlord's share would show a profit over and above his expense.

Plantations are exhausted by the continuous cotton growing, and the yields can only be increased by giving the land regular doses of humus and nitrogen, and these can only be produced by establishing a regular rotation and a live stock industry. But this is impossible with the present distribution of the land into small lots to the share farmers. Evidently then a farming corporation, if it wants to work at a profit, must give up the share system and have recourse to the wage system.

As a good and paying rotation the writer suggests the following: 1st year: long or short staple cotton; 2nd year: early or late maize; 3rd year: fall oats followed by cowpeas in June. He then calculates, on the basis of one dollar a day, average wages for common field work, and one dollar a day for the cost of mule work, the cost of the above crops per acre (see Table).

The average outlay per acre per annum that the planter would have to pay would be somewhat higher than under the half-share system, but in exchange he would get the whole of considerably increased crops, so that his farming would be much more profitable.

1289 - **The Cost of Wheat-farming in Victoria.** — RICHARDSON, A. E. V. in *The Pastoral Review*, Vol. XXIII, No. 8, pp. 785-786. Melbourne, August 15, 1913.

The cost o growing wheat varies considerably in different parts of the State. It is lowest in the Mallee district and highest in the north-east and Goulburn Valley where the soils are extremely difficult to work.

Allowing 2*s* 6*d* for a horse and 7*s* for a man per day, the average cost of the various operations is as follows:

	Per acre		
	s d		*s d*
Ploughing	6 9	to	8 0
Three harrowings	2 3	»	2 3
Three scarifyings or cultivations	6 0	»	7 6
Drilling	2 0	»	2 0
Seed	3 0	»	4 0
Superphosphate	2 6	»	3 9

Since two-fifths of the wheat is sown on fallow land, interest on the land lying idle for nine to twelve months should be reckoned in the cost of cultivation of the wheat.

Harvesting is generally done by means of a harvester or a stripper and winnower and the cost comes to about 3*s* 9*d* per acre, with 2*s* or 3*s* extra for the cost of the bags according to the size of the crop. The cost of cartage to the station averages about 2*s* per acre, stacking at the station 1*d* per bag, loading on trucks ½*d* per bag, store charges ¼*d* per bushel, and stevedoring 1*s* 6*d* per ton, or ½*d* per bushel.

The average haulage of wheat for Victoria in the season 1910-11 was 174 miles, at a cost of 10*s* 9*d* per ton, or 3.49*d* per bushel; since January of last year this railage has been reduced to 9*s* 9*d* per ton, or 3.16*d* per bushel.

1290 – **The Profitableness of keeping Productive Stock,** on the basis of the results of 32 farms affiliated to the Book-keeping Office of the German Agricultural Association (Deutsche Landwirtschafts Gesellschaft), during the year 1912-1913. — GUTKNECHT, in *Mitteilungen der Deutschen LandwirtschaftsGesellschaft*, Year XXVIII, Part 35, pp. 493-498; Part 36, pp. 507-510. Berlin, August 30 and September 6, 1913.

The researches upon the profitableness of keeping productive live stock easily lead to contradictory results and to erroneous opinions when they are based on the bare figures furnished by the yearly balancing of the ledger without considering the special character of the individual farms. The formerly usual method of investigation, namely by direct calculation, is better adapted to give a correct idea of the connexion between net profit and the keeping of productive live stock, by the fact that it seeks the causes of profit or loss.

The writer consequently adopts this method in the present investigation and describes the system followed in his calculation, which comprises in the *Debit*:

1. The value of the stock as per inventory.
2. The outlay for the purchase of stock, for veterinary assistance, and for sundries as per cash book.
3. The forage as per crop book.
4. The value of the increase of stock, from the stock account.
5. The amount of labour spent upon the live stock, from the stock account.
6. From the general accounts the share of the cost of management, upkeep of buildings and implements and insurance.

On the *Credit* side:

The value of the live stock at the end of the year, to which are added the figures of the amounts received for animals sold, those of the animals or their produce taken by the owner or his household, and those of the head passed to other branches of stock breeding.

In a table which contains all the figures exerting any influence on the result, the profitableness (Rentabilität) is calculated for the individual farms, which, according to their geographical position and to their kind of farming, are divided into several groups. Of 22 farms only six show a profit on their milk cattle accounts; to obtain the net profit from these the interest of the capital invested in milch-cattle and in stabling should be subtracted. The average profit amounts to 2 ½ *d* per head and per day, the maximum being 5.2 *d* and the minimum 0.63 *d*; the loss on the other 16 farms amounts on the average to 3.3 *d*, the maximum being 8.32 *d*, and the minimum 0.68*d*. Of six farms about which only the total result of the keeping of productive stock could be calculated, three showed a loss (2.35 - 3.16 - 5.365 *d*) and three a profit (1.03 - 0.62 - 3.07 *d*), while of the seven farms in which the results of fattening cattle could be calculated separately, four closed their accounts with profit (an average of 1.8 *d* per head and per day) and three with loss (average of 3.98 *d*).

The writer then discusses the result and its causes for each farm and on this basis draws some general conclusions. The unfavourable result obtained in the majority of cases, notwithstanding the fact that the interest of the capital invested in stock and in stabling has not been calculated in the expenses, obliges one to recognise that with the present state of agricultural science and technique the necessity arises of giving up, completely or partially, the keeping of productive stock.

This verdict, however, is subject to some modification if it be considered that in the above calculations the prices of farmyard manure and of certain fodders (such as pasture grass and other green foods such as beet leaves) have been fixed without sufficiently considering that they were for wares that cannot be sold in the market; the result is that the manure is valued low and the fodders too high. The former was estimated on the basis of the prices which the plant foods are paid in artificials, and without taking into consideration that it can be replaced by lime, green manuring and fallow. The unsaleable fodders were estimated at schematic purchase prices without giving due weight to the special conditions of the farms; while with but few exceptions, the live stock is to be debited only with the effective cost of the pasture and of the green fodder and with the manurial value of the residues of the hoed crops used as fodder. It can therefore be considered that in reality the giving up of live stock would mean for many farms a diminution of net returns. This question can consequently only be resolved case by case according to the individual conditions of the farms as to climate, geological and economic condition, the losses on the trade in live stock, the special kind of farming, the division of labour and the capacity of the manager of the farm.

The keeping of live stock can be considered as an independent branch of farming which buys and sells at market prices only where actual market prices exist for all the products, as for instance in the neighbourhood of large towns. In every other case the great changes that would be caused to the whole of the farm by giving up the keeping of productive stock have to be considered. Only after having valued the unsaleable products of the soil from this point of view is it possible to ascertain by direct calculation the profitableness of keeping productive stock.

1291 - **Profitableness of Fattening Cattle in Illinois.** — KIDDER, R. L., A Cattle-Feeding Experience. — *The Breeder's Gazette*, Vol. 64, No. 10, p. 397. Chicago, September 3, 1913.

The writer bought on August 1, 1912, at the Kansas City market, 30 head of cattle weighing 24 300 lbs. They cost $ 5.65 per cwt. The commission was $12, the writer's railway fare and expenses were $ 20, freight and feed bill $ 37.22; total cost $ 1 440.

The cattle were put on good timber blue-grass pasture till October 28, when they weighed 27 600 lbs., having gained in the 83 days 110 lbs. each. The animals were then put on a 14-acre stubble-field and fed snapped corn and oat straw, and what they could get out of the stubble. The corn and hay rations were increased gradually, until by Thanksgiving (about the end of November) they were on full feed. They were now again weighed, and their weight (when left without feed or water all night) was only 27 440 lbs.

Until near Xmas the cattle were fed in the open; afterwards they were taken into the feedlot and sheds. From January 1, 1913, they received daily about ½ lb. of 50 per cent. alfalfa molasses feed, shucked corn being partially substituted for the snapped corn, and hay and straw being fed in decreasing quantities. On January 16, the total weight of the cattle was 30 760 lbs. About this time, cottonseed meal was added gradually to the ration till the amount per head per day reached 2 lbs. in the last fortnight.

On March 25 they were shipped to Chicago. They weighed 1 161 lbs. at the station of departure, and 1 128 lbs. on reaching Chicago, where they fetched $ 8.30 per cwt.

The total expenses incurred were as follows:

Price of cattle	$	1 440.00
Corn, 1800 bushels at 43 cents	»	774.00
Cottonseed meal at $ 37 per ton	»	28.25
Molasses feed	»	26.25
Pasture	»	120.00
Salt	»	2.50
Hay, 3 tons at $ 12 per ton	»	36.00
Straw, 2 tons at $ 4 per ton	»	8.00
Interest on investment, at 6 per cent	»	58.00
Depreciation on bunks	»	7.00
Total	$	2 500.00

If the cost of wages is set against the price fetched by manure and fattened hogs, the net outlay was $ 2 740, and the clear profit was $ 240, or $ 8 per head.

AGRICULTURAL INDUSTRIES.

1292 - **Investigations into the Solubility of Milk Proteins.** — LINDET, L. M. in *L'Industrie Laitière*, Year 38, No. 34, pp. 543-547; No. 35, pp. 557-561. Paris, August 24 and 31, 1913.

DAIRYING.

This article is a summary of numerous investigations into the solubility of the casein and albumens present in milk. The writer is of opinion that on the coagulation of milk, a large quantity of casein, as well as albumen, passes over into the serum. The two serum proteins behave nearly alike as regards solubility in the serum elements, the formation of precipitate, the property of coagulation and of attaching themselves to the coagulated casein. The only notable difference is in the rotation angle, which is 30° in the case of the albumen and 116° in that of the casein.

With the addition to the milk of lime or phosphatic salts, a decrease takes place in the solubility of both albumen and casein alike. The cause of this is probably a decrease in the solvent present in the serum.

The following is a summary of the results of the experiments:

1. A difference exists between the soluble proteins and the decomposition products of casein in milk; the latter dissolve in such large quantities in milk that they are easily demonstrated in the serum elements.

2. From its solubility in the serum on the addition of calcium chloride, its power of attachment to the coagulated casein, and its coagulation at high temperatures, there is every reason to consider the albumen a casein. Albumen should be known therefore as casein β, to distinguish it from the other form, casein α, which is always present in larger quantities.

3. The total amount of soluble albumen and casein in milk is always nearly constant, but the amount of each present is very variable.

4. The soluble albumen and casein adhere by capillarity to the suspended casein and are more concentrated in the micellae of the latter than in the serum.

1293 - **On the Defect Known as "Knypers" in Edam Cheese.** (1) — BOEKHONT and OTT DE VRIES in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 28, Part 4-5, pp. 108-111; Vol. 38, Part 19-20, pp. 462-484. Jena, September 20, 1910, and August 9, 1913.

This defect in the cheese is characterized by one or more large cracks running obliquely across it and dividing it up into separate portions. Only the rind, as a rule, remains intact and holds the cheese together. The defect makes its appearance when the cheeses are from 12 to 14 days old, and can be detected by the full tone they give on tapping and the sinking in of the rind where the cracks occur. The latter are full of gas-bubbles consisting of varying proportions of CO_2, H and N.

The writer has ascertained by means of many isolation experiments and the examination of a large number of cheeses that the defect is due to a virulent, anaerobic, butyric-acid producing bacterium, with an optimum temperature of about 22°C., which produces spores, especially when cultivated on gelatine, and is absent from normal Edam cheese. This micro-organism can be rendered innocuous by the addition to the milk of 0.01 per cent. of potassium nitrate. If the milk is rich in ordinary Coli bacteria, the writer advises the use of a slightly stronger solution. The article contains an account of the experiments and illustrations of cheeses affected by Knypers disease.

WINE-MAKING

1294 - **Grecian Wines.** — CHASSIOTIS (Director of Agriculture, Athens) in *La Vie agricole et rurale*, Year 2, No. 40, pp. 350-352. Paris, September 6, 1913.

Grecian wines may be classified as follows: dark red, dry white, common red, liqueur and dessert wines.

1. *Dark red wines.* — They are chiefly used in blending and are exported either as they are or mixed with thin wines. They contain considerable amounts of extract and tannic and astringent matter, and their percentage of alcohol is about 10° to 15° Gay-Lussac. The following wines belong to this class: Coumis (Eubœa) 10-11.5°; Leucadia, Saint-Maure

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(1) See p. 130, *B.* Nov. 1910. *(Ed.)*.

11.5-13° ; Corfu 12-13.8°; Paros and Antiparos 11.5-12°; Nemea (Corinth) 12-14°; Santorin 12-15°; Acarnania 12-13°; Cephalonia 13.5-15°; Volos 10-12°.

2. *Dry white table wines.* — Most of these wines are used for local consumption as rosined wines (1), made by adding 2 to 5 per cent. of pine resin to the must before fermentation. Those exported are not subjected to this process. The most important white wines are from Calchis, Aliveria (Eubœa) 11-12°; Salamina and Aegina (Attica) 12-13.5°; Elis and Corinth 12-14°; the plateaus of Tripolitza and Mantinia (Arcadia) 8-10°.

3. *Common red wines.* — Some of these wines are consumed locally and the rest exported. They are dry, slightly sweet and contain a high percentage of alcohol. The most important districts are Xirochovi (Eubœea); Paros, Zea (Archipelago), the Ionian Islands ; Cephalonia, which produces; a wine (Mavrodaphne) resembling Malmsey, 13-14°; Santorin 13-13.5°; Corinth, Achaia, Patras, Pyrgos, Calamata 11.5-12°. At Rapsani, in Thessaly, near the Olympian mountains, a wine is produced of a beautiful ruby colour, slightly tart, with a fine bouquet, 11-12°. The wines of Triccala Karditsa, in Acarnania, generally possess strength and fineness, but are often lacking in freshness.

4. *Liqueur and dessert wines.* — These are generally white wines, sometimes with a light golden tint. Their strength is almost always natural. Whenever alcohol is added only the rectified alcohol of wine is used. They are found chiefly in the islands, such as Cephalonia (muscat wine) and Santorin (vino santo).

Generally the Greek cultivator only makes a portion of his harvest into wine for his own consumption and sells the remainder in the form of must to retail wine merchants, and hotel and restaurant keepers, who make their own wines. These generally buy at about 10 frs. per hectolitre (4 ¼ *d* per gallon) and retail the wine at 40 to 50c. the litre (1s 5*d* to 1s 10 *d* per gal.) Large establishments making wine for export are few in Greece.

During the last 20 years the exports of wine and must, sent chiefly to Italy, Germany, Austria, England, France and America have been as follows:

Average of the periods:	Hectolitres
1896–1900	240 000
1901–1905	210 000
1906–1909	280 000
1910	639 000
1911	612 759

One hectolitre = 22 gallons.

The exportation is less than one-tenth of the total production of the country ; it has increased a little during the past three years owing to the use of fresh currants following upon the various measures of foreign countries against the wines of dried grapes.

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(1) See No. 1257, *B*. April 1911. (*Ed.*).

The crisis in the wine trade which now prevails in Greece is due chiefly to the disturbance in the raisin industry, to the enormous emigration, which has depleted the country of some 200 000 peasants, representing a surplus of 400 000 hectolitres, and to the increasing popularity of beer shops in place of taverns. An other important factor is the great irregularity in the quality of the wines produced from one year to another, due partly to the ignorance of modern methods of wine-making. The following measures can be adopted for developing the industry: the popularising of better methods of wine-making, formation of co-operative cellars, direct dealings with the consumers, and exemption from duties.

Raisins. — The spread of phylloxera in France resulted in a rapid development in the production of raisins in Greece, until in 1905 it had reached the total of 150 000 to 170 000 tons from an area of 190 000 acres; about the same quantity is produced at the present time. In 1889 France alone took 70 000 tons of raisins for wine-making, but by 1892, owing to reconstitution, the demand had fallen off, and the addition of a duty caused an intense crisis in Greece; the excess supply soon reached 30 000 to 50 000 tons, so that the price fell from 200 frs. to 30 frs. the 1 000 lbs. To deal with this crisis, the Bank of Athens founded in 1905 a privileged society for encouraging the production of and trade in currants. This Society levies an export duty of 7 frs. per 1000 lbs, and withdraws from the market into its warehouses a certain quantity of the year's production (20 to 35 per cent). It also takes for storage any quantity of raisins or currants the producers wish to deposit; if the grower does not withdraw them, the society takes them over at a price varying between 115 and 140 frs. per 1000 lbs. according to the quality. The society has not the right of exportation of any of the produce it has obtained, but can only make use of it for local consumption or various industrial purposes. It has also to pay a duty to the State (amounting to 4 ½ million francs) on the dried grapes passing through its hands, and to spend a fixed sum on advertising in other countries. Further, the society must grant growers who wish to grub their vineyards an indemnity of 800 to 1 000 frs. per hectare (£13 to £16 per acre). The quantity of dried grapes generally retained by the society is about 50 000 tons per annum, the greater part of which is consumed by secondary societies in the manufacture of alcohol for strengthening liqueur wines, or for industrial purposes.

Since the foundation of the Society the extreme prices have been 115 and 200 frs. per 1000 lbs., and the average selling price is at present about 140 frs. As a result of advertising, the foreign consumption has also increased. Thus the average consumption of the United Kingdom has risen from 55 000 tons in 1900-05 to 61 000 tons for 1906-11.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

1295 - **Calcareous Chlorosis of Green Plants. The Part Played by Root Excretions in Absorbing Iron from Calcareous Soils** (1). — MAZÉ, P., RUOT, M. and LEMOIGNE, M. in *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 2nd Half-year, Vol. 157, No. 12 (September 22, 1913), pp. 495-498. Paris, 1913.

The writers have shown that the chlorosis attributed to the presence in the soil of an excess of lime is due to the fact that the iron is rendered insoluble by the calcium carbonate (2); they also add that those plants which have thus suffered from a deficiency in iron must be incapable of dissolving its oxides through the absence of free mineral and organic acids in their root excretions.

	I gms.	II** gms.	III gms.	IV gms.	V
Calcium nitrate	1.—	0.5	0.5	0.5	The same as I diluted to one half.
Potassium phosphate (*)	0.25	—	—	0.25	
Ammonium sulphate	0.2	—	0.1	0.2	
Magnesium sulphate	0.05	0.25	0.2	0.1	
Ferrous sulphate	0.025	0.005	0.025	0.025	
Calcium chloride	0.1	—	0.1	0.1	
Potassium silicate	0.025	—	—	0.025	
Aluminium sulphate	0.025	—	—	—	
Manganese chloride	0.025	—	0.025	0.025	
Zinc chloride	traces	—	—	traces	
Spring water	1000	1000	1000	1000	
Potassium sulphate	—	0.25	0.2	—	
Calcium sulphate	—	0.25	—	—	
Tricalcic phosphate	—	0.25	0.5	—	
Sodium chloride	—	0.25	—	—	

* Reduced nearly to neutrality to phenolphthalein by the addition of potash.
** This is the solution used by E. Lambert for cultures of peas.

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(1) See No. 1206, *B.* Oct. 1913. (*Ed.*)
(2) See No. 1462, *B.* Oct. 1912. (*Ed.*)

This conclusion is supported by a series of experiments summarized in this note.

The researches were carried out on *Vicia narbonensis* (1) and the Caractacus pea. These plants were grown in an aseptic medium, with solutions of different compositions. *Vicia narbonensis* was cultivated in solution I, and the peas in solutions II, III, IV and V of the accompanying table.

With the addition of 2 per cent. of calcium carbonate, all these solutions evoked intense chlorosis in the *Vicia* and the peas; the disease also appeared in the peas growing in the control solutions without calcium carbonate. The course of the disease was identical with that followed by the writers in 1912.

It was shown by using some drops of a 0.1 per thousand solution of ferric nitrate that the decoloration was certainly again due to want of iron. Half the affected plants were then divided into two lots, and a few c. c. of one of the following solutions, *a* and *b*, were introduced into their nutritive solutions.

Solution *a*	gm.	Solution *b*	gm.
Seignette salt	0.1	Sodium citrate	0.1
Tartaric acid	0.01	Citric acid	0.01
Distilled water	1000	Distilled water	1000

The object of the organic acids is to dissolve small quantities of iron in the presence of calcium carbonate, and to allow the roots to take these up from the solution.

When this treatment was carried out, the affected plants became green in the sun in the course of two or three days according to the clearness of the sky. The *Vicia* plants gradually resumed the normal green of the controls which did not show the slightest trace of discoloration ; they resumed their activity, while the chlorotic plants which had not been treated lost their leaves and died.

The existence of the disease is signalised in the case of the roots by a pink coloration of the nutritive solution; the roots themselves assume an ochreous tint. The very slight acidification of the media by the addition of solution *a* or *b* caused the gradual disappearance of the pinkish tint, and the rootlets which grew subsequently were as white as those of the controls.

The peas gave the same results with a delay varying according to the nature of the solution in the case of the controls. The pink coloration of the nutritive solution was correlative with the evolution of the disease, disappearing on treatment as in the case of *Vicia*.

The general occurrence of the disease, even in the absence of calcium carbonate, is explained by the large amount of soluble calcium in the solutions. The absorbed calcium is in part eliminated by the roots in the form of the carbonate ; thus the iron fails to come into solution exactly where it ought to be absorbed.

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(1) A South European species much resembling the field bean. (*Ed.*)

Treatment with acid solutions has caused diseased plants to become green again, even when more discoloured than the cholorotic *Vicia* plants, but the cure was not in every case effected by one treatment, the most obstimate cases requiring a second, more energetic treatment.

Of the four solutions used for growing the peas, III proved the best in retarding the appearance of the disease.

The two acid solutions added for the solution of the iron were equally efficacious.

The writers have therefore succeeded in producing at will the occurrence of calcareous chlorosis in plants, which, under natural conditions can stand fairly large doses of calcium carbonate; but the presence of soluble calcium salts and the addition of calcium carbonate place the plants under the conditions obtaining in the case of a waterlogged chalky soil of which all the insoluble components would be encrusted with lime.

The introduction into the solution of small qualities of free organic acids brings into solution minute quantities of iron and causes the disappearance of chlorosis.

The resistant plants act in the same manner; and if American vines become chlorotic in calcareous soils, this is because their root excretions are not sufficiently acid. This does not mean that the acidity of their sap is less than that of the resistant plants, but proves that the decomposition of the organic acids — the food of the plant — is more complete in the roots of species susceptible to chlorosis.

A soluble ferric compound, in the presence of calcium carbonate, will always conquer the disease, provided at the same time it is able to resist chemical or microbiochemical destructive agents, a condition of affairs which it is difficult to obtain.

The best preventive treatment therefore consists in washing over the vines and the ends of the pruned canes with a solution of iron sulphate. As a remedy ferric nitrate is preferable. A solution of this compound at 0.2 per thousand sprayed onto the leaves is absorbed in a few hours, and never fails to produce rapid results.

Iron sulphate is most suitable for leguminous plants which have need of sulphur, since deficiency in the latter substance, as has already been shown by Mazé (1), also occasions intense chlorosis.

1296 – **The Unfavourable Effect Produced by Various Fungicides, Insecticides and Insectifuges upon the Germination of Vine Pollen.** – GARINO-CANINA, E. Influence des traitements sur la germination du pollen des vignes. - *Annales de la Science Agronomique française et étrangère,* Year 30, No. 2, pp. 113-130, figs. I-X. Paris, August 1913.

The writer set himself the task of determining whether the fungicides, insecticides and insectifuges most commonly applied to the vine at the time of flowering have any influence upon the normal germination of its pollen, a subject concerning which there were no data either from practical experience or laboratory work.

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(1) See No. 223, *B*. Jan. 1912. (*Ed.*)

As the subject of the experiment, the very readily germinating pollen of Aramon × Rupestris Ganzin No. 1 was selected; the material came from vines under glass. This pollen, when dried on blotting paper, almost completely preserved its germinating property.

The chemicals used were as follows: cupro-ammoniacal solution, copper sulphate, copper acetate, potassium arsenate, lead arsenite, lead acetate, mercuric chloride, barium chloride, potassium permanganate, calcium hydrate, potassium sulphide, sulphur, sulphurous acid (1), acetic acid, phenol, nicotine, pyridine, soap, nicotine soap.

After several attempts, the writer found that Strasburger's solution (15 per cent. saccharose and 1.5 per cent. gelatine in distilled water) was the medium most suited to the rapid development of the pollen grain, and best adapted for the observation of its growth (especially if this solution were slightly acidified with sulphuric acid). He therefore used this compound as a control, adding to it, in turn, for purposes of experiment, varying proportions of the above-mentioned substances.

He thereby discovered that the latter exercise a more or less toxic action upon the germination of pollen grains; some entirely prevented germination (cupro-ammoniacal solution, copper sulphate, sulphur dioxide, lead acetate, copper acetate, potassium arsenate, lead arsenite, mercuric chloride, calcium hydrate, phenol, soft soap); others (powdered sulphur, barium chloride, potassium sulphide, potassium permanganate, acetic acid, nicotine, pyridine) retarded germination and caused degeneration of the pollen grain. It was further found that cupro-ammoniacal solution stronger than 0.05 per cent. hindered germination, the limit of concentration in the case of copper sulphate being also about 0.05 per cent.

Copper and other heavy metals kill the protoplasm. Pollen which had first been placed for 6 hours in a 0.75 per cent. solution of copper sulphate, then put in a filter and washed with distilled water until all the free copper was removed, was observed and compared with pollen which had been left in distilled water for the same space of time. The latter pollen grains alone germinated; those which had been submitted to the action of the sulphate remained inert in spite of the washing. Further, contrary to the generally-received opinion according to which the first sulphuring for control of powdery mildew is favourable to fertilization, the writer found in the course of his experiments *in vitro* that sulphur exercises a retarding action upon pollen germination. This is explained by the production of sulphurous acid, which is toxic to the pollen as well as to most micro-organisms. The writer intends to verify the toxic action of sulphur spraying upon the flower by means of closer and practical experiment.

In another experiment he used pollen from three different European vines, all in flower at the same time: Black Alicante, considered by growers as a vine with pollen of strong fertilizing property; Alexandrian muscat, of which the fertilization is often irregular; and Bicane, with an agglomerate pollen occurring in very thick masses and considered barren. The culture of these three pollens in the control solution with the addition in turn of copper sulphate, potassium arsenate, soft soap, precipitated sulphur and sulphur dioxide, gave the same order of results as those already obtained for Aramon × Rupestris Ganzin No. 1. It is notable that the Bicane pollen, when placed in the control medium, which was very favourable to the germination of the other pollens, showed no results, thus confirming the observations made by the vine-growers. Observed dry, Bicane pollen was clearly distinguishable by its shape from the other dry pollens examined. The writer proposes repeating his experiments on the flowers, in order to ascertain whether the above-mentioned compounds have an equally poisonous effect upon the ovary.

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(1) See No. 727, *B.* April 1912. (*Ed.*).

BACTERIAL AND FUNGOID DISEASES.

GENERALITIES

1297 - **The Influence exerted by Fumagine upon the Assimilation and Respiration of the Host Plants.** — NICOLAS, G. in *Revue générale de Botanique*, Vol. XXV, No. 297, pp. 385-396. Paris, September 15, 1913.

It is generally held that the fumagine fungi which cover the branches and particularly the leaves of certain plants with a more or less thick black coating are injurious chiefly because they hinder assimilation and respiration. This idea was not based on any precise observations, so the writer undertook experiments to test its accuracy.

Leaves covered with fumagine were divided in two, one half being freed from the fungus; the two halves, or symmetrical portions of them, were introduced into tubes containing air with 8 to 10 per cent. of carbon dioxide and saturated with moisture. The apparatus of Bonnier and Mangin was used for the analysis of the gases, and in each case two determinations were made.

From thirteen experiments with *Nerium Oleander* L., *Citrus Aurantium* L., *Olea europea* L., *Psidium aromaticum* Aubl., *Gardenia Thunbergia* L. f., *Bumelia tenax* Wild. and *Sciadophyllum ellipticum* Blume, it is clear that fumagine hinders both assimilation and respiration. The retardation of these processes depends on the thickness and density of the fungus coating.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1298 - **Some New or Rare Plant Parasites in Italy.** — MONTEMARTINI, L. Alcune malattie nuove o rare, osservate dal Laboratorio di Patologia vegetale di Milano.— *Rivista di Patologia vegetale*, Year VI, No. 7, pp. 204-210. Pavia, September 1913.

Diseased cucumbers from the neighbourhood of Milan were found to be attacked by *Cladosporium cucumerinum* Ell. et Arth. (*C. Cucumeris* Frank); the disease had been noticed for two or three years, but it was not till 1913 that serious damage was caused; in some gardens 95 per cent. of the crop was lost. The fungus was already recorded from Italy and Germany, but not as doing damage; in the United States, however, it has long been known as a serious pest

Septoria Iridis Massalongo was found as an undoubted parasite on young leaves of *Iris* in Rome; it had been recorded by Massalongo only on withering leaves of *I. germanica*. The spores were larger than those described by Massalongo.

Botrytis vulgaris is recorded on camelias in a cold greenhouse at Pavia.

Cladosporium Pisi Cug. et Macch. is recorded on a white-seeded French bean at Pavia; this is a new host, peas and broad beans being the ones previously known.

The writer records three cases of parasitism on "occasional hosts". The first is *Fumago vagans* Pers., which spread from an oak to neighbouring brambles, blackthorns and elms. The others refer to *Cuscuta*: *C. Epithymum* Murr. was found to spread onto *Galium verticillatum* and *Plantago media* from clover, and *C. europaea* onto grasses from nettles.

1299 - **Tomato Rot.** — PAVARINO, L. in *Rivista di Patologia Vegetale*, Year VI, No. 6, pp. 161-163. Pavia, August 1913.

The micro-organism *Phytobacter lycopersicum* n. sp., isolated by Groenewege (1) in Holland in 1913 from tomatoes attacked by rot, presents the same morphological and cultural characters as *Bacterium Briosii*, which had already been isolated by the writer (2) in 1910 from material collected in Italy.

As only *Bacterium* and *Bacillus* are now recognised as genera of bacteria, the latter name must stand.

1300 - ***Gloeosporium Darlingtoniae*** **Parasitic on** ***Darlingtonia californica*****, an Ornamental Plant.** — KLEBAHN, H. Beiträge zur Kenntnis der Fungi imperfecti, II. — *Mycologisches Centralblatt*, Vol. III, Part 3, pp. 97-115, figs. 16-33. Jena, September 1913.

The specimens of *Darlingtonia californica* Torr. growing in the Botanic Gardens at Hamburg were attacked during the course of the summer of 1904 by a disease characterised externally by the green tissues turning brown, and which destroyed several plants in a short space of time. Microscopic examination having revealed the presence of mycelium in the discoloured tissue, and of conidia on the surface of the affected portions, it seemed probable that a fungus was the source of the trouble. Infection experiments carried out in September 1905 gave positive results. Wishing to repeat these experiments during the autumn of 1912, the writer scarcely found two affected plants; the fungus developed late, infection was light and the disease spread little. Perhaps this was attributable to the advanced period of the year at which the experiments were carried out, but it is equally possible that between 1905 and 1912 the fungus had become less virulent or the host plant more resistant.

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(1) See No. 613, *B.* May 1913. (*Ed.*).

(2) See No. 1544, *B.* May 1911. (*Ed.*).

After giving the results of anatomical investigation upon a portion of the material which had been artificially infected, and of his observations upon pure cultures of the fungus, the writer states that the parasite of *Darlingtonia* already entitled by Potebnia *Discula Darlingtoniae* is a new species of *Gloeosporium*, to which he has given the name of *G. Darlingtoniae.* The writer discusses the question of the value of Von Thümen's *Discella Darlingtoniae,* which seems to be based on a fungus occurring on some other tree.

The writer describes in another chapter a *Pestalozzia* which he found, as well as the *Gloeosporium*, on the dead portions of diseased plants of *Darlingtonia californica.* In microtome sections, another conidial form was found together with the *Pestalozzia.* It is unlikely that this belongs to the development cycle of the *Pestalozzia,* so that it may be connected with *Gloeosporium Darlingtoniae.*

Pestalozzia must be regarded as essentially saprophytic. The infection experiments on *Darlingtonia* always gave negative results. In pure cultures, free conidia were not obtained at first, but there occurred upon a stroma a great development of fructiferous bodies (true pycnidia), which contained the characteristic *Pestalozzia* conidia. On continuing the researches, the formation of free conidia on the substratum was subsquently obtained.

The appearance in the cultures of true pycnidia, and especially the fact that the fructiferous bodies which are formed under natural conditions upon the substratum are true pycnidia with a pseudoparenchymatous investment, shows that the genus *Pestalozzia* is wrongly placed among the *Melanconiaceae.* It would be better referred to the *Sphaeropsideae* (*Sphaerioideae, Phaeophragmiae*), and placed near the genus *Hendersonia.* The *Pestalozzia* found on the *Darlingtonia* belongs to the morphological type of *P. versicolor* Spegazz., but owing to some of its characters, a special place has been assigned to it.

1301 – **The Results of the Control of the American Gooseberry Mildew *(Spaerotheca mors-uvae)* in Russia.** — DE JACZEWSKI, A. Quelqucs mots sur le traitement de *Sphaerotheca mors-uvae.* — *La Revue de Phytopathologie appliquée*, Vol. I, No. 6-7, pp. 87-88. Paris, August 20-September 5, 1913.

In Russia, this disease began to attack the gooseberry bushes at the beginning of the century, but it appears that the fungus was introduced from America into the Southern provinces towards 1890. The Institute of Phytopathology at St. Petersburg has devised the following system of control, which is based on a long and varied series of experiments (1), and is most efficacious if properly carried out :

1. — In autumn, when the leaves fall, the ground round the bushes should be thoroughly dug over, in order to bury as deeply as possible the dead leaves and the berries bearing the mycelium and perithecia of the fungus.

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(1) See No. 2021, *B.* June 1911; No. 722, *B.* April 1912. (*Ed.*).

2. — The branches, and the soil beneath the bushes, must be well sprayed with a solution of sulphate of iron (30 gms. per litre, or 3 lbs. in 10 gallons).

3. — In spring, before the buds break, the bushes should be pruned by removing all thickly-growing branches which hinder the penetration of light and air; care being taken to prop up any branches which touch the ground; after this, the spraying should be repeated as in autumn.

4. — As soon as the young leaves have made their appearance, spraying must be begun; the best compounds for this purpose will be mentioned later. If the treatment is preventive, three or four sprayings at 15 or 18 days' interval are all that is required; but if the disease becomes rife, as it has done in Russia, much more frequent spraying (every 10 or 12 days) is necessary until the berries turn colour; after the gooseberries are gathered, it is well to spray once or twice more; the young shoots especially should be treated, as at this time they are most liable to be attacked by the fungus.

As for the fungicides for summer spraying, a Bordeaux mixture at 1 or 2 per cent. (1) and copper salts in general, have merely a preventive effect. Before the appearance of the disease, it is possible by means of very careful spraying with copper salts to arrest the development of the parasite, but if the fungus is fully developed, Bordeaux mixture has no effect, very likely because the thick felt of the oidium does not permit of the penetration of the copper salt. Only one compound with a copper base has been found equal to the sprays to be mentioned: this is azurine (copper sulphate and ammonia) at 3 gms. per litre (3 lbs. in 100 gallons); it has given excellent results, without scorching or harming the leaves, but its price is relatively high.

On the other hand, the experiments made at the Institute have shown that sulphur (2) usually brings about the fall of almost all the leaves. For the same reason, mixtures of sulphur and quicklime are not suitable to the case in question; 1 per cent., and even ½ per cent., lime-sulphur washes (3) bring off most of the leaves. Amongst the other sulphur compounds, those which have given the best results practically everywhere in Russia during the last few years are alkaline polysulphides; it is true that they cause some leaf-fall, but by using only 2 or 3 gms. per litre (2 or 3 lbs. per 100 gallons), and spraying only in the evening or early morning, as well as by accustoming the leaves to sulphur when they are quite young, the damage due to scorching and leaf-fall can be avoided. The susceptibility to injury from these sprays varies according to the varieties, and certain hardy ones are not at all affected by the application of polysulphides.

M. Doroguine, the Assistant at the Institute, has for nearly two years been occupied in testing various alkaline compounds. He has found that ordinary commercial soda (3 gms. per litre, or 3 lbs. per 100 gallons) is no less efficacious than polysulphides and azurine, and costs much less. The only defect of this solution is that it does not adhere sufficiently to the leaves and is easily washed off by rain, which necessitates spraying at frequent intervals, in the case of a severe attack every 8 or 10 days. To obviate this difficulty, however, it is only necessary to add to every 2 or 3 gallons a handful of flour, or a spoonful of treacle. Perhaps great adhesive power could more easily be obtained with soap emulsion, or the addition of gelatine. Caustic potash in the same proportions seems to have an effect similar to that of soda.

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(1) See p. 163, *B.* Nov. 1910; No. 856. *B.* May 1912. (*Ed.*).
(2) See p. 163, *B.* Nov. 1910. (*Ed.*).
(3) See No. 856, *B.* May 1912; No. 884, *B.* July 1913. (*Ed.*).

Sphaerotheca mors-uvae often attacks currants, particularly black, in Russia; but it seems that, as in the case of the *Uredineae*, there are biological races of the parasite, since in plantations consisting of different species of *Ribes*, one is attacked, while the others are immune. Varieties of the same species also differ in their predisposition to the disease.

1302 – **Bacteria isolated from European and American Vines Affected by "Bramble-leaf".** — FAVARINO, L. Ricerche sul Roncet. — ID. Ulteriori ricerche sul Roncet. — *Rivista di Patologia Vegetale*, Year VI, No. 6 (August 1913), pp. 164-170 and No. 7 (September 1913), pp. 193-203. Pavia, 1913.

The writer has been occupied in investigating the abundant material received from Sicily and other parts of Italy in order to ascertain whether any bacterial or fungoid parasite exists, which, by its constant presence, lends any support to the opinion of those investigators (Viala, Briosi, Pichi, Delacroix and others) who consider " bramble-leaf " (" roncet " in French) a parasitic disease.

He introduced portions of diseased vines (stems, branches and shoots) into different nutritive media, after having previously carefully disinfected them, and obtained the development, in cultures which were originally pure, of some micro-organisms mostly of a bacillus type; he describes their morphological and cultural characters.

From a specimen of Rupestris du Lot affected with typical " bramble-leaf ", received from Palermo, three micro-organisms were isolated; one seemed identical with *Bacillus Baccarinii* Macch. (*B. vitivorus* Bacc.) and is the cause of the vine disease known in Italy as the " mal nero ". He also isolated a fourth micro-organism from other specimens of Rupestris du Lot from Noto (Sicily). The Rupestris from the nurseries at Vittoria (Sicily) alone produced no pure cultures, owing to their remaining contaminated. Finally, from young wild plants of Riparia × Rupestris sent from Voghera (Prov. of Pavia), two micro-organisms of similar character, and therefore to be referred to the same species, were obtained. No cultures were obtained from rooted shoots on which Barbera was grafted, also sent from Voghera.

In the case of *Bacillus Baccarinii*, it must be assumed, until proof is found to the contrary, that it can, under certain conditions, also become the cause of " bramble-leaf ", if this disease, which is difficult to identify, is considered to be a form of " mal nero " with more or less grave symptoms according to the resistance of the vine. It may be that these bacteria are saprophytes, which, under exceptional circumstances, become pathogenic. According to the researches of Meissner, Zahn, Hausen, Buchner, Lehmann and others, the healthy tissues of animals and plants do not contain bacteria capable of development. It may, however, be a question of non-pathogenic organisms occurring at the same time as the "active" parasite, or subsequently to the latter, as is suggested by the last researches of E. F. Smith. In any case, only experiments on artificial infection, which will be made in the course of time, can determine the "bramble-leaf" micro-organisms and decide whether those with which we have just dealt are among them, and whether in addition to the specific and active micro-organism, other non-pathogenic species occur at the same time.

1303 - ***Bacillus Vitis*, a new Schizomycete, Parasitic on American Vines in Liguria.** — MONTEMARTINI, L. Un nuovo Schizomicete della vite. — *Rivista di Patologia Vegetale*, Year VI, No. 6, pp. 171-176. Pavia, August 1913.

The Government Nursery of American vines at Ventimiglia (Liguria) was established about twenty years ago near the river Roia upon a pebbly, light and arid subsoil; it is irrigated intermittently and badly manured with the sweepings of the town. Five years ago, some vines growing there were in a serious condition which increased with time, and ended in the death of the plants. The disease spread, and destroyed a large part of the nursery. The Rupestris were the most affected; the Aramon × Rupestris also suffered, while the various Riparia hybrids proved immune.

During the first years of the attack, special cultural operations were carried out round the diseased vines, the latter being plentifully manured. The vines which were substituted for the diseased plants were able to grow, and scions grafted on shoots taken from the diseased vines have done well up to the present. The distribution of the disease in the nursery has always been irregular. The diseased vines occur chiefly in the interior of the plots; those on the outside having more air and light appear to be still healthy.

At first, the disease presented the characters of a general weakening of the vegetative growth of the plants (production of small feeble shoots, with the formation of suckers). It is only of late years that the most seriously affected vines have showed symptoms of "bramble-leaf".

The writer observed in the case of the withering vines which he collected and studied in 1911, that transverse sections of the vine wood and largest roots showed blackish patches of irregular shape and distribution occurring singly or together in a section, with indefinite boundaries, and varying in diameter from some millimeters to half a centimeter. The existence of these patches, and the fact that in the same places the vessels were obstructed by tyloses, or by masses of viscous substance, aroused the suspicion of the presence of a gummosis of bacillus origin, and caused the writer to search the wood of the infected vines for some definite micro-organism. The bacillus which had been isolated in 1911, was again isolated in 1913 by Prof. Pavarino from the organs of other vines (also from the green parts) from the same nursery in a more advanced stage of the disease.

The fact of having found this bacillus after an interval of two years, and upon a certain number of plants, and that it possessed constant morphological and cultural characters, makes it probable that this micro-organism is of some importance in the etiology of the disease, and led the writer, when giving a complete description of the bacillus, to propose for it the provisional name of *Bacillus Vitis*. The latter differs as much from *B. Baccarinii* Macch. (*B. vitivorus* Bacc.), found in the wood of vines suffering from "mal nero", as from the forms of Schizomycetes isolated by Naso from vines affected by the same disease. Neither has it been possible to identify it with any of the polymorphic, and sometimes entirely saprophytic, micro-organisms occurring so frequently upon plants. Only inoculation experiments can decide if *B. Vitis* is really pathogenic, and the cause of the destruction of the vines in the nursery. For the moment, all that can be said is that the above-described disease presents the phenomenon of rachitis accompanied (either as primary or secondary cause) by an alteration of the wood, with the formation of gum and the presence of a special Schizomycete. This " rachitism " is very similar to " brambleleaf ", so that it is possible that the disease commonly known by the latter name is not an affection always due to the same cause, but is rather a symptom attributable to a variety of agencies (parasitic, climatic or edaphic).

1304 – The "Rote Brenner" *(Pseudopeziza tracheiphila)* of the Vine. (1)

MÜLLER-THURGAU, HERMANN. Der rote Brenner des Weinstockes. II. Theil. — *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part II, Vol. 38, Nos. 21-25, pp. 586-621, 1 plate. Jena, September 20, 1913.

In an article in the same journal for 1903 the writer stated that *Pseudopeziza tracheiphila* was the cause of this vine disease, which had formerly been attributed to atmospheric agency. As some investigators still denied the parasitic nature of the affection, Hr. Müller-Thurgau carried out further researches which confirmed those he had previously made. He succeeded in growing the fungus upon vine leaves killed artificially ; he also observed the manner in which it passes the winter upon the fallen leaves of the previous year ; and he has been able to reproduce the disease on living leaves. The infection depends upon the age and the water content of the leaves.

The writer recommends for the control of the parasite, the improvement of the physical constitution of the soil and of the state of nutrition of the plants, the planting of resistant vines, and spraying the young leaves with Bordeaux mixture, etc.

1305 – Two Fungi as Causal Agents in Gummosis of Lemon Trees in California *(Botrytis vulgaris* and *Pythiacystis citrophthora)*.

— FAWCETT, H. S. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 601-617 + 12 figs. Sacramento, California, August 1913.

The term " gummosis " expresses the result of the disease rather than the actual disease itself. It is characterised by dying areas of bark accompanied by exudation of gum. It has been shown to be due to the presence of one or other of two fungi, commonly known in packing houses as brown rot fungus (*Pythiacystis citrophthora*) and grey fungus (*Botrytis vulgaris*) respectively.

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(1) See also No. 877, *B.* July 1913. (*Ed.*).

Various physiological explanations have been given for this disease, owing to the failure of attempts to induce it by inoculation. Later experiments have shown that inoculation is successful only when the diseased material is obtained from the advancing edges of diseased areas. The tissues already permeated with gum in the diseased areas always failed to induce the disease when transplanted to healthy bark. The two types of the disease are as follows:

1. Grey Fungus (*Botrytis vulgaris*). — In attacks of this fungus the outer layer of bark is killed much in advance of the inner, in which there is some softening of the bark. Pure cultures of this fungus were obtained and successful inoculations produced. In bad attacks of the fungus in moist weather, raised cushion-like patches of grey spore-covered bodies appeared on the surface. It was found that neats-foot oil applied to the inoculated wounds encouraged the fungus and exaggerated its effects.

2. Brown Rot (*Pythiacystis citrophthora*). — This is the most common form of gummosis. The bark remains hard from the beginning and is killed slowly through to the wood without any evidence of fungus growth. Pure cultures were obtained and the fungus proved to be the cause of this form of gummosis. Neats-foot oil appeared to be without effect on this form of the disease.

The brown rot fungus is known to live in the soil, and this explains why flooding the trunk of the tree or burying the bud union below the soil, is favourable to the development of the disease. Young trees are more resistant to the disease than old ones and inoculations on various citrus trees have shown that the lemon is most susceptible, the sweet orange next and sour orange least of all. This explains why sour orange trees are least subject to attacks of gummosis under unfavourable orchard conditions, and also why lemons cannot be well grown on their own roots in California.

Treatment. — Bordeaux paste has been found most effective, made as follows: 1 lb. blue stone (copper sulphate) disolved in 1 gallon of water in a wooden vessel; 2 lbs. of uns aked lime, slaked in about ½ gallon of water. Stir together when cool and apply with a brush. It should always be used fresh. Cutting out the diseased bark is necessary before applying the paste and care should be taken to remove the edges of the diseased area. Gum may exude after applying the paste, indicating that infested bark exists outside the treated area. If the infected area is considerable it may be more desirable to isolate it by removing strips of bark only and applying the paste to the edges to prevent spreading of the disease.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1306 - **The Froghopper Egg Parasite (*Oligosita giraulti* Crawford) and its Colonisation in the Cane Fields.** — URICH, F. W. in *Board of Agriculture, Trinidad and Tobago, Circular* No. 11, pp. 5-9. Port-of Spain, Trinidad, August 18, 1913.

This parasite on the eggs of froghoppers in cane fields has been determined by Crawford as *Oligosita giraulti*. It has been bred from the grass from numerous sugar cane estates.

Life History. — It is an extremely active insect and runs over dead cane and grass leaves very rapidly. It locates the eggs of froghoppers in dried tissues and after a thorough examination lays its eggs inside them.

Oviposition takes from 4 to 30 minutes according to the state of the eggs. A certain stage in the development of the froghopper egg is found to be more favourable to the development of the parasite. This was found by experiment to be when the hatching-lid of the froghopper egg was well formed and black in colour. The parasite failed to develop on the eggs of the host if they were young or newly laid. The period of development of the parasite to the perfect insect is from 22 to 41 days.

During the development of the embryo the normal froghopper egg remains quite white ; but when parasitized it changes colour after 5 to 7 days, becoming grey and then quite black. In such eggs the red coloration of the parasite can be made out a day or two before emergence by viewing the egg by transmitted light.

The adult parasite measures about 0.5 mm. and appears to be always searching for froghopper eggs, passing from one piece of grass to another by short leaps. Up to the present no males have been observed, and females kept in confinement reproduce parthenogenetically with an average of 8 offspring.

Since the eggs of the host require more moisture for development than the parasite, it is possible for two generations of the latter to attack the same batch of froghopper eggs, and as a female parasite is ready to lay her eggs within an hour after emergence, the multiplication of the froghopper is seriously checked. The percentage of parasitism works out at about 16 to 25.

With a view to increasing the extent of this parasitism, the artificial breeding of the parasites and their liberation in the cane fields has been recommended. This method is rather slow and it is found to be much more expedient to transfer cartloads of the grass infested with parasites to the cane fields. By this method it is hoped that colonies of the parasite may be established in the cane fields and the froghopper kept in check.

INSECTS INJURIOUS TO VARIOUS CROPS

1307 - **A Billbug Injurious to Small Grain: *Sphenophorus discolor*.** — SMITH, H. S. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 619-621, figs. Sacramento, California, August 1913.

Species of *Sphenophorus* have been known to attack corn (maize) and sugar cane and become serious pests in some parts of the United States, but were not recorded as attacking small grain in California until quite recently, when considerable damage was being done to the experimental plots of wheat, barley and oats. The beetles attack the stem of the ears and sever it within the sheath. The ear turns white and fails to develop grains. No larvae or purpae have been observed yet and it is thought that this insect has bred from the growth of tule or bullrush (*Scirpus lacustris*), from which this land has been but recently reclaimed. Careful destruction of these rushes is therefore recommended in reclaiming this type of land.

1308 – **Larvae of *Gortyna ochracea* and *Vanessa (Pyrameis) Cardui* attacking Artichokes in France.** (1) — BOURILLY, A. Note sur deux lépidoptères des artichauts. — *Journal d'Agriculture pratique*, 1913, Vol. II, No. 38, pp. 373-374. Paris, September 18, 1913. — TSCHAËN, E. La Noctuelle de l'Artichaut (*Gortyna ochracea* Hübner). — *La Revue de Phytopathologie appliqueé*, Vol. I, No. 3, p. 107-108, fig. 1-2. Paris, September 20, 1913. — VIDAL, E. Deux Ennemis de l'Artichaut. — *La Petite Revue Agricole et Horticole*, Year 19, No. 451, p. 211. Antibes, September 23, 1913.

In the spring of 1913 the artichokes in the neighbourhood of Hyères were severely attacked by the caterpillars of two Lepidoptera.

One of these is *Gortyna ochracea* (" Frosted Orange " moth); Tschaën records the examples in question as G. *ochracea* var. *xanthenes* Germar (= var. *cinerea* Gooss ns), while Vidal considers it a distinct species and names it *Hydroecia xanthenes* Germ. All three writers refer to the serious damage done by these larvae, which bore into the stems and heads, and sometimes also attack the heads from outside.

So far, the most effective treatment appears to be cutting off and burning the affected stalks. Tschaën advises burning the whole plant after the crop is gathered, to destroy the larvae and pupae it harbours. As this species attacks many wild plants, Bourilly and Tschaën recommend the clearing away of all weeds near the artichoke beds.

The caterpillars of the Painted Lady (*Pyrameis cardui*) damage the crop by destroying the leaf tissue. Vidal considers that the only good means of dealing with them is to pick off and burn the leaves as they are attacked. All the chrysalides of *Pyrameis cardui* sent to the Natural History Museum in Paris during 1913 were found to be parisitized by Chalcids of two different genera.

1309 – ***Cladius (Priophorus) padi* attacking Strawberries in France.** — VUILLET, A. Un ennemi du fraisier. — *La Revue de Phytopathologie appliquée*, Vol. I, No. 6-7, pp. 97-98. Paris, August 20-September 5, 1913.

In June 1913, two hymenopterous larvae (fam. *Tenthredinidae*), which had been damaging a strawberry bed, were sent from Bressuire (Deux-Sèvres) to the Paris Entomological Station. The writer was able to ascertain by breeding that they were the larvae of *Cladius* (*Priophorus*) *padi* L., an insect of wide distribution in Europe, where it lives at the expense of a large number of different species of plants. Although it appeared not to have been recorded before as occurring on the strawberry, its presence on this plant is not surprising, all the more as it has a strong predilection for Rosaceae (hawthorn, wild rose, pear, plum, etc.). After having briefly described the different stages of development of this insect, the writer mentions as natural enemies of the larva, *Tryphon lucidulus* Hart. and *Ichneutes reunitor* Nees.

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(1) See No. 1224, *B*. Oct. 1913. (*Ed*.).

As means of controlling the pest, spraying with nicotine or arsenical compounds is to be recommended; care should always be taken to treat the lower surface of the leaves. Since strawberries should not be sprayed after the fruits are formed, it is best to apply the preventive treatment before flowering. When the crop is gathered, it is an easy matter to destroy the last generations of the insect.

1310 - ***Serica anthracina* Lec., a Scarabaeid, defoliating Orchards in California.** — Essig, E. O. The Manzanita Serica. — *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 622-623, + fig. Sacramento, California, August 1913.

An orchard of prune and apple trees in El Dorado County was considerably defoliated during April and May. The writer found this beetle (fam. Scarabaeidae) at work and noticed that the attack was worst round the boundary of the orchard. He was therefore led to discover the insect in wild shubbery adjoining. It was found to be particularly abundant on Manzanita (*Arctostaphyllos* sp.) and also occurred on black oak, lupins and *Ceanothus* sp. The beetle varies from light brown to almost black in colour and is less than half an inch long. Owing to its timidity it is exceedingly difficult to find on the leaves.

The remedy recommended consists of: 8 lbs. lead arsenate, 8 lbs. lime to 100 gallons of water. This should be sprayed early and the tender shoots liberally drenched with it.

1311 - **The Peruvian Fruit-Fly (*Anastrepha peruviana* N. Sp.).** — Townsend, Charles H. T., in *The Journal of Economic Entomology*, Vol. 6, No. 4. Concord, N. H., August 1913.

The Peruvian coast region has long been known to be infected with the fruit-fly, a pest which attacks citrus as well as deciduous fruits, particularly during the month of February.

In February 1912 a guava tree at Sullana in the Chira valley, Peru, was completely infested by Trypetid maggots, and the fly was to be seen among the fruits at the same time. The writer reared numbers of these maggots, and flies were produced from the 4th to the 10th of March. This same tree having shed all its diseased fruits during February, produced a second crop in March, which contained only one infested fruit containing one small maggot, thus indicating the distinctness of generations.

As the insect does not appear to have been identified before, the writer describes it under the name of *Anastrepha peruviana*, and mentions the characters which distinguish it from the closely allied species *A. fraterculа*.

As a remedy he recommends spraying the foliage before the fruits begin to ripen, or as soon as the presence of the flies is noted, with the following mixture : lead arsenate 5 to 10 lbs., chancaca (brown or black cane-sugar in cakes) 25 to 50 lbs., and water 100 gallons. The chancaca must be dissolved in boiling water before adding to the arsenate solution. Variation in the amount of arsenate added is required for different kinds of foliage, guava and orange standing much more than peach, and the sugar content should vary in the same proportion.

1312 - **Insects injurious to Olives: *Saissetia oleae (= Lecanium oleae), Zeuzera pyrina (= Z. aesculi), Prays oleaellus, Euphyllura olivina (= Psylla oleae)* and *Hylesinus oleiperda*,** — DEL GUERCIO, GIACOMO. Nuova contribuzione alla conoscenza dei nemici dell'Olivo. — *Redia*, Vol. IX, Part I, pp. 59-75. Florence, August 28, 1913.

1. — It is well known that the eggs of the black scale of olives (*Saissetia oleae = Lecanium oleae*) hatch out in large numbers from the 10th to the 20th of June, and that quantities of larvae are to be found on the leaves and branches. This period is therefore considered to be the most favourable time for the destruction of the insect. However, in 1912, according to the writer's observations in Apulia, hatching of these eggs continued from the beginning of June until the middle of August, or about 65 to 70 days. A fact intimately connected with the preceding is the emission of excremental liquids ejected to considerable distances by the females of *Saissetia* and of juices caused by the repeated punctures of the insects; the quantities of these are responsible for the appearance and spread of fumagine, as the writer has been able to observe experimentally.

Further, the period of activity of the female scales is in agreement with that of the development of the olive fly (*Dacus oleae*), which feeds on the sugary secretions of *Saissetia* and of the no less abundant olive sucker (*Euphyllura olivina = Psylla oleae*) and infests the olives. The destruction of these insects is therefore necessary on account of the favourable conditions which they produce for the development of *Dacus oleae*. The appearance and rapid spread of species of *Cicada* and *Cicadetta* or *Tettigia*, which, by the excretion of large quantities of liquid on the surface of the leaves, produce conditions favourable to the development of the olive fly, would necessitate similar measures.

2. — In Italy, olives are attacked by the larvae of a Swift moth (*Zeuzera pyrina = Z. aesculi.*), known locally as " Rodilegno ", " Tarlo bianco ", " Tarlo giallo ", on pears and apples ; though very destructive, this has so far been neglected ; it attacks a number of trees, including fruit-trees, but in Apulia, Calabria, Sicily and Tuscany prefers olives. In Apulia it is only found in large numbers on the most improved varieties (known as " Ogliarole "), whilst the " Olivastro " and the wild olive are almost immune ; the same may be said of the Nardò olive, which is also partially resistant to *Dacus oleae*. In this district the larvae of *Zeuzera* often attack good-sized branches, provided the bark is still smooth, so that in the hot weather these dry up and drop all their flowers and fruit ; many such branches, however, do not die off at once, but remain as centres of infection for several years, producing no fruit. Many labourers in these districts are very skilful in finding the grubs; eight persons may go over 12 000 to 14 000

trees in three weeks, collecting 50 to 60 thousand grubs, which are paid for at 10 lire (8*s*, or $ 2) per thousand.

Observations by various entomologists on pear trees, have shown that the moths lay their eggs during July. The writer has found that in Apulia the larvae hardly begin to pupate before the second half of July, while the majority do not do so till the middle of August. Consequently only the earliest moths appear at the beginning of August, the bulk emerging much later. For this reason collecting of grubs should not begin before August, and should continue till the latest pupae are destroyed.

3. — In the spring of 1912 the olives in the neighbourhood of Serranova (Apulia) flowered with extraordinary vigour, many shoots bearing a thoussand or more flowers; but only some thirty to fifty set owing to damage by olive suckers (*Euphyllura olivina*) and Hyponomeutids (*Prays oleaellus*). On some branches only one of these insects occurred, on others both. The damage extended over a considerable area, and amounted to some millions of lire.

In the second half of June quantities of *Ageniaspis* emerged from the *Prays* pupae, though many were themselves parasitized by an undetermined microbe within the pupae.

4. — Both in Apulia and in Liguria the writer has observed that the *Prays* moths fly away from the olives in June and July, and seek shelter under the thickest, lowest and most shaded leaves of vines, and to a less extent of pears, plums, cherries and figs. By means of dishes containing poisoned treacle or other liquids, or only water (used in experiments for the control of the olive fly), it was found that the flight takes place principally at the end of June and in the first few days of July. Treacle attracted them more than the other liquids, and water hardly at all. The writer believes that they leave the olives in search of moisture, and in particular of liquids on which they can feed.

5. — With regard to the olive-bark borer (*Hylesinus oleiperda*), the emergence of the adults seems to take place later than is recorded by Costa; in 1912 it lasted from just before the middle of May to nearly the middle of July ; in 1913 it was the same, and the females were found still wandering on the bark as late as July 25.

Experiments showed that this insect will not attack cut twigs, even if they are kept fresh, as those confined with such twigs died without egg-laying ; on twigs attached to the tree, egg-laying was more abundant on whole twigs than on those cut back. It is thus evident that healthy trees are liable to attack.

6. — It was previously believed that the olives remaining after the disappearance of the olive suckers were safe ; but the writer has observed that they are liable to fall in July if situated near parts of the flowering shoot which have been pierced by the sucker. This explains why flowering shoots with twenty or thirty olives on, but only attacked at the base, sometimes wither up completely. This "running off" of the young olives goes on throughout July, and, according to the writer's 1912 observations, stops when the fruits are nearly as big as peas.

ALFREDO RUGGERI, *gerente responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Work of the Imperial Institute for the Economic Development of the British Colonies and India

by

Professor WYNDHAM DUNSTAN, C.M.G., LL.D., F.R.S.,

Director of the Imperial Institute,
President of the International Association for Tropical Agriculture.

The Imperial Institute is organised by the British Government with the Cooperation of the Governments of the British Dominions, Crown Colonies and India, to assist economic development, more especially of the Crown Colonies and India, by arranging for general information comprehensive exhibits explaining and illustrating the agricultural and other natural resources of these countries and by conducting enquiries and investigations, required by the local agricultural and other technical departments, and furnishing information respecting the economic possibilities and value of raw materials, especially of new or little known products, to manufacturers, merchants and other enquirers at home.

The first of these branches of work is carried on through the Public Galleries of the Institute in which all the Countries of the Empire are represented by collections of their principal economic products; by maps and diagrams explanatory of their industries and trade; and by photographs, pictures and other exhibits illustrative of their present condition. To these Galleries visitors are admitted without charge. Each section of the Collections is in charge of a Technical Superintendent who is accessible to visitors and who receives enquiries respecting the Colonies and their resources which are replied to verbally or by letter. In the centre of the Galleries is a Stand for the distribution of literature relating to India and the Colonies to applicants for special information of all kinds relating to these countries. Last year the number of visitors to the Public Galleries was 205 503 and 17 545 publications were supplied to enquirers from the Central Stand. The visitors include the general public, students from schools and other educational institutions in London and throughout the home country, who are specially conducted through sections of the Galleries and the features of each section explained; other visitors are commercial men, intending settlers, etc., who are in search of special information respecting particular countries and their possibilities. The Galleries thus provide aa economic conspectus of the resources of the British Empire.

The Central Gallery is occupied by exhibits from South Africa, the West Indies, the Mediterranean Possessions and Australasia; the Eastern Gallery by those of Canada, which extend into the North Gallery; the Western Gallery by those of the Straits Settlements and Malay States, Ceylon and India. The native industries of India are shown in the Indian Pavilion, whilst a Pavilion for Ceylon will be opened next year. The North Gallery contains the exhibits of Hong Kong, East and West Africa, Uganda, Nyasaland, Mauritius, Seychelles, the Sudan and Newfoundland and a part of those of Canada. All the important agricultural products of India and the British Colonies are exhibited with full explanatory labels, whilst for purposes of comparison a collection of the standard commercial products used in British Industries is separately shown in the East Upper Gallery.

The Scientific and Technical Research Department of the Institute includes a large staff of investigators and an extensive series of laboratories, working rooms and reference collections of products. Its chief business is to collect and distribute information respecting the natural products, vegetable and mineral, and the industrial possibilities of each country of the Empire and to conduct, in co-operation with manufacturers and merchants, scientific and technical enquiries and investigations with a view to the utilisation of new or little-known products and their introduction to Commerce. Many of these enquiries and investigations are initiated by the Agricultural Departments abroad and by manufacturers and others at home. Every year several hundred reports are made, chiefly to the Governments of the Colonies, respecting the commercial value of every class of natural product andthe methods of producing it and preparing it for the market. The Department therefore assists Agricultural Departments in the Colonies by conducting investigations which can only be sucessfully undertaken by specially trained investigators, or those which require co-operation with manufacturers and other experts at home. Last year the methods of cultivation or production, the quality and the commercial value of numerous products were examined and reported on, including cereals and other food stuffs, essential oils, tobacco, fibres, tanning materials, gums and resins, rubber, vegetable oils and fats, drugs. A large number of investigations related to the composition and value of newly discovered minerals and have been the means of initiating commercial enterprise in several countries. The Department has also been intimately concerned in the development of the rubber industry in several of the Colonies and with the extended production and utilisation of vegetable oils. Large numbers of enquiries on these and similar subjects are each year received from manufacturers and merchants in the United Kingdom. A large collection of reference samples of important products is maintained by this Department, as to which full information can be supplied with a view to their commercial utilisation. Detailed information respecting the operations of this Department is supplied to Parliament in an "Annual Report." Special reports are also issued as Parliamentary Publications on important classes of products which have formed the subject of investigation in the Department such as "Rubber", "Foodstuffs", "Gums and Resins", "Fibres", etc.

A considerable amount of original research on subjects connected with tropical agriculture is also carried on in the laboratories of the Department. In a series of researches the results of which have been communicated to the Royal Society of London, it has been shown that the occasional poisonous properties exhibited by certain tropical foodstuffs, the Lotus of Egypt, Sorghum, Cassava and Phaseolus are due to the temporary presence within the plants of glucosides which give rise to the production of prussic acid, and the occurrence of which in certain cases may be modified by cultivation. For this subject the name proposed of "cyanogenesis" has been generally adopted and similar observations as to the occurrence of "cyanogenetic" glucosides in other plants have been made by other workers.

The cause of the Molteno or Pictou disease in horses, which is well known in South Africa and Canada, has been traced through investigations in the Department to an alkaloid which occurs in a species of groundsel (*Senecio*) eaten by the animals.

The alkaloids in some of the most important of the Indian aconites have been isolated and characterised and shown to be of medicinal value. Similarly the active constituents of a number of drugs have been ascertained and the chemical constitution of numerous new essential oils has been determined. Among new materials the constituents of which have been ascertained in the Department and which have been introduced to commerce may be mentioned: the oil of the Para Rubber seed as a substitute for linseed oil, the wax of a South African myrtle for the manufacture of polishes for wood and leather, the pods of an Indian *Caesalpinia* as a valuable tanning agent.

Among the more important investigations carried on in conjunction with Agricultural Departments in the tropics may be mentioned the extensive enquiry which is in progress in conjunction with the Agricultural Department of Ceylon in order to determine the precise variations in the composition of rubber latex dependent on variations in age and methods of tapping and on the value of various methods of coagulating and preparing rubber in the form best adapted for commercial use.

The Scientific and Technical Department has become a central establishment for the conducting of enquiries and researches auxiliary to all branches of tropical agriculture; specially trained members of its staff, botanists, chemists, and mineralogists, have been appointed to the technical departments in a number of the British Dominions.

The "Bulletin of the Imperial Institute" is published quarterly and serves not only as a means of disseminating information respecting the enquiries and investigations conducted at the Institute, but also of providing a progress report on the development of agriculture and other industries throughout the world, more especially with reference to the utilisation of the raw materials of the tropics. It also includes special articles by authorities in different parts of the world. Among these may be mentioned, "The Cotton Worm in Egypt" by G. C. Dudgeon, Director General of Agriculture in Egypt, "Agricultural Progress in Uganda" by P. H. Lamb, lately Chief Agricultural Officer in Uganda, "Agricultural Progress in the German Colonies" by Dr. Busse of the German Colonial Office. In order to provide information respecting the cultivation and production of the chief agricultural products of the Colonies the "Imperial Institute Series of Handbooks to the Commercial Resources of the Tropics" is being published. The volumes at present issued relate to the "Agricultural and Forest Products of British West Africa", "Cocoa" and "Rubber". Other volumes are in preparation.

The Imperial Institute is the headquarters of several societies which are conducting work of general Imperial utility, including the Tropical Diseases Bureau and the British Section of the International Association for Tropical Agriculture, a branch of the Association which has its Central Bureau in Paris. In June 1914 an International Congress of Tropical Agriculture under the auspices of this Association will be held in London at the Imperial Institute, and in connection with it two important International Exhibitions will also be held, one relating to Rubber and the other to Cotton and Fibres.

On the Organization of the Meteorological Service in Hungary

by

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I. — History of the Service.

In the sitting of April 6, 1868, the Hungarian Academy of Sciences approved the scheme, later presented to the Ministry of Public Instruction, which concerned the systematic organization of the meteorological observations to be made in the country and the creation of an independent institute for the purpose. Consequently upon this initiative, and with the approval of the King, given in Vienna on April 8, 1870, the creation of this institute was decided, and its first director was nominated on July 12 of the same year.

In the beginning the Institute was purely scientific and its activity was limited to research on the meteorology and terrestrial magnetism of the country. For a long while, about twenty years, its sphere of action was very restricted, its staff being small (only the director and two employees), and the funds at its disposal were besides quite inadequate (the budget for 1871 amounted to £617). The Institute did not possess an observatory in the strict sense of the word, and in 1871 had at its disposal only 47 stations. In such conditions the Institute had to limit itself to working up and publishing insignificant observations. With time, however, work of practical importance came to be added to the exclusively scientific service, thus enlarging the scope of the Institute; this included the organization of a network of pluviometric stations, established with the object of regularising the watercourses and giving warnings of approaching inundations, and also the organization of the weather forecast service.

These new branches of activity brought the Institute into closer touch with the Ministry of Agriculture, which at first granted a subsidy under the form of assistance for upkeep. In 1893 the Institute passed from the jurisdiction of the Ministry of Instruction to that of Agriculture. From this moment the activity of the Institute began to extend. The means were increased and the staff also. Consequent upon this administrative change, the Institute underwent in 1896 a new organization, under which the Service was divided into sections according to the work done. In 1900, a special building was erected at Ogyalla for the Central Observatory of Meteorology and Terrestrial Magnetism, and finally in 1910 the Institute was transferred to Budapest in its own building, where the seat of the Central Office and one of the first-class stations are situated.

II. — PRESENT ORGANIZATION.

The Institute is divided at present into 6 sections, namely: 1) climatological, 2) pluviometric, 3) forecasting, 4) aerological, 5) observatory, 6) presidential section. At the head of each section there is a chief, appointed by the Director, who distributes the work of the section among the various employees.

1. *Climatological section.* — This section is the centre of the Institute; it has the duty of collecting exact data on the meteorological conditions of the country, and of determining its climate. The available network of climatological observation consists of 180 stations, of which 10 are stations of the first class, 80 of the second, and 90 of the third. The latter devote themselves exclusively to the systematic collection of thermo-udometric data. The stations of the second class, besides instruments for measuring temperature and rainfall, are provided also with the necessary material for observations of other meteorological factors. They register principally: barometric pressure, moisture of the air, direction and force of the wind, and the shape of the clouds. They generally possess a barometer, maximum and minimum thermometers, a psychometer (August type) and sometimes hygrometer and wind-vane (Wild type); some of them are

also provided with heliographs (Campbell-Stokes type) and with thermometers for measuring the temperature of the soil. The stations of the first class differ from those of the second in that they use also self-registering apparatus.

The climatological section works up the observations written on special forms which it receives every month, it checks their correctness and publishes them in the first part of the *Meteorological Annual.* In this first part the daily readings of 14 stations are published *in extenso* on the international model, whilst for the other stations only monthly and yearly summaries are published. This section also collects for the Central Statistical Office the monthly observations of 14 stations which appear regularly in the *Monthly Statistical Publications.* It publishes besides, in a monthly bulletin, the meteorological conditions of the preceding month, and the average monthly readings of 30 stations and their deviation from the normal average. This monthly bulletin, accompanied by a map showing the distribution of rainfall, is designed especially for abroad.

Daily observations are made in all the stations at 7 a. m., 2 p. m. and 9 p. m. The diagrams of the registering apparatus of the stations of the first class are worked up by a subdivision (registering section) of the climatological section. The data afforded by the registering instruments are published in the second part of the *Meteorological Annual.*

Two other small groups of observatories belong to the climatological section. They are devoted to special objects, namely vine-growing and forestry. The Institute does not control them except from the meteorological point of view and, according to an agreement, works up the data and forwards them to the Central Ampelographical Institute at Budapest or to the Central Forest Experiment Station at Selmeczbánya : these two institutions utilize these data from the point of view of growth of vegetation and of phytopathology. Eleven second-class stations, all of them situated in vineyards, belong to the vine-growing group of observatories; they possess, besides the usual instruments, heliographs and thermometers for measuring the temperature of the soil. The forest group includes eight double stations, of which one works under the trees and the other in the clearings.

For more precise and detailed researches on the meteorological conditions of the largest plain of Hungary (Alföld), nine stations have begun working at the commencement of 1913, all of them being situated in the open country. The thermometers are placed in shelters (English type) in identical conditions. It is hoped that these stations established in the plain at equal distances and protected against disturbing influences will furnish data which may be used as a basis even for the theoretical studies of climatology.

2. *Rainfall Section.* — This section is especially devoted to hydrographical purposes. The number of these stations is 1200, each of which disposes of two raingauges ; 14 stations possess also pluviographs. For the distribution of these stations special attention is given to mountainous regions. In a monthly report the section forwards to the Institute the data

on the daily quantities of rainfall measured. During the winter the depth of the snow is also measured. The Institute publishes all these data in the 4th part of its *Meteorological Annual*, partly *in extenso* and partly under the form of monthly and yearly totals. The *Annual* contains, as an appendix, maps showing in detail the distribution of rainfall over the whole country based on the monthly and yearly data. Among the rainfall stations there are 100 for giving warning of approaching inundations which telegraph the data of rainfall to the Hydrographic Section. This in its turn works up these data for its daily reports on the water-level of rivers and streams. During the winter months remarks on the conditions of thawing are added to the telegram, and for this object the stations are provided with thermometers. On the other hand, during the winter all the pluviometric stations send postcards containing information on the snow conditions every ten days direct to the Hydrographical Station. Up to the end of 1912 there was a special storm service in the Institute. The results of its observations were published in the 3rd part of the *Annual*. But at the beginning of 1913 this service, previously undertaken by voluntary collaborators, was handed over to the pluviometric section.

3. *Forecasting section.* — This section draws up the telegram concerning the state of atmospheric conditions and the forecasts as to the same. It publishes two bulletins every day: 1) on the atmospheric conditions of Hungary; 2) on those of the whole of Europe.

The publication of a National Meteorological Bulletin satisfies a want generally felt, for during the growing season the centres interested and the general public wish to have, as soon as possible, reliable information on the meteorological conditions of the country, especially concerning the rainfall, which has so great an influence on the crops. Thus the daily rainfall of about 150 localities is to be found in the National Meteorological Bulletin. As has already been stated, 100 pluviometric stations telegraph data on rainfall to the Hydrographical Section, which forwards them by telephone to the Institute. There are besides about fifty other stations which send telegrams concerning other meteorological factors, namely: 23 stations send readings taken at 9 p. m. and at 7 a. m. on the atmospheric pressure, temperature, wind and clouds, besides the observations made during the preceding 24 hours on rainfall and maximum and minimum temperatures; 27 stations telegraph all the above data with the exception of those concerning atmospheric pressure. The data are used as a basis for the National Bulletin, in which the figures are collected in Tables, and diagrams show the curves of equal rainfall and of equal temperatures, while the text summarizes the weather conditions of the previous day.

The European Meteorological Bulletin contains the weather reports of the evening and of the morning from 14 Hungarian stations, 9 Austrian, 10 German, 9 French and Swiss, 6 English, 5 Scandinavian, 20 Russian, 15 from the Balkan peninsula and 9 Italian, which are sent according to the international form of meteorological telegrams. This Bulletin is illustrated by two maps: one is a synopsis showing the state of the weather in the morning, and the other is a small map showing the isobars of the preceding evening. The text gives a condensed description of the meteorological events of the preceding day in the whole of Europe and publishes the forecasts for the next 24 hours.

The forecasting service itself deals with the international telegraphic service. It receives in its own telegraph office the telegrams from abroad (for the most part collective telegrams arrive from Vienna, Hamburg, Rome and St. Petersburg), and sends out to the foreign central stations the data from Hungarian stations; it also forwards European information to Belgrade, Sofia and Bucharest.

The two Bulletins appear during the first hours of the afternoon; in the capital they are immediately handed over to the newspapers, to the municipal authorities and to private subscribers; to the provinces they are posted. As neither the Bulletins nor the newspapers can publish the weather forecasts rapidly enough these have, since 1891, been circulated throughout the country by telegram. The section draws up at noon the telegram of forecasts; a copy is sent to the Central Telegraph Office, which forwards it all over the country, together with the circular telegram containing the Budapest official Stock Exchange and market news.

The text of the forecast telegram consists of a form of 34 phrases containing all that is required for stating weather conditions. The telegraph offices that have the duty of hanging up the weather forecasts for public inspection are supplied with special frames on which small plates may be hung. These plates bear permanent inscriptions corresponding to the text of the forecast. Each frame can carry 12 plates for the names of the months, 31 for the days of the month and 34 for the text of the forecast. At present about 400 telegraph offices keep these forecasts exposed to the public.

On the strength of the information received by telegram the forecasting section draws up a weather report every two weeks and sends it to the agricultural section of the Ministry of Agriculture. This report shows on a chart the distribution of the rainfall (and the areas damaged by hail) and completes the report on the state of the crops.

4. *Aerological section.* — With the exception of some stations at an elevated altitude, the Institute has not done much in this direction. It is only since the beginning of 1913 that it has included in its programme the study of the upper strata of the atmosphere, limiting itself to: 1) sending up daily a pilot balloon and following its course with theodolites; 2) sending up free unmanned ballons on the same days as other countries send up theirs, as per international arrangement. The data thus acquired are sent to the seat of the International Scientific Aerostatic Committee at Strassburg.

5. *Observatory.* — The Central Observatory of the Institute is situated at Ogyalla in the small Hungarian plain (Kis Magyar Alföld). The Observatory building includes the offices and the dwellings of some of the officials. On the tower anemographs are placed, while the meteorological instruments are situated in the garden. Two other observatories are attached to it, one for terrestrial magnetism and the other for seismological observations and

for the study of the electriciry of the atmosphere. The data furnished by the Observatory are published in the second part of the *Meteorological Annual*, which contains the hourly readings of all the weather registering apparatus, the data of terrestrial magnetism and those of the potential of the electricity of the atmosphere.

6. *Presidents' section.* — This deals with administrative affairs, such as questions relating to the budget, part of the correspondence, inventories and the like.

The Institute possesses a well-equipped workshop in which the instruments are built and repaired.

The library contains at present 8246 books and 3646 pamphlets, mostly on meteorology and worth nearly £3 000.

The majority of the collaborators of the Institute are unpaid, but they get some bonuses. Thus a pluviometric station is allowed an average of 25 shillings a year, and 50 shillings if it attends also to sending off the telegrams. A second-class telegraph station gets £3 6*s* 6*d*; some stations the permanency of which is especially desirable, or which have self-registering apparatus, get from £4 3*s* to £8 6*s*. The total amount of bonuses granted by the Institute amounts to about £1458.

Regular inspections ensure the orderly and regular service of the stations.

The principal official publications of the Institute are: 1) the *Meteorological Annual*, published every year in four volumes; 2) the two *Daily Meteorological Bulletins;* 3) the *Scientific Annual* containing, *a*) a large series in two languages for the publication of original work, *b*) a smaller series published only in Magyar; 4) *Report upon the Year's Work of the Institute* in the Magyar and German languages.

Besides the above, an Official of the Institute publishes with its assistance a Monthly Meteorological Review called Idöjárás ("The state of the atmosphere"), now in its eighteenth year. Since its first appearance it has been distributed free of charge to about 350 collaborators.

While chiefly dealing with the knowledge of the meteorological conditions of Hungary, the Institute keeps in touch with kindred institutions abroad. It must also be mentioned that the data on meteorological conditions which the Institute collects at the request of public offices and private persons increase from year to year.

The name of the Institute is *Magyar Királyi országos Meteorologia és Foldmágnességi Intézet* (Royal Hungarian Institute of Meteorology and Terrestrial Magnetism). Its seat is at Budapest and it is a dependency of the Ministry of Agriculture. Its yearly budget amounts generally to about £9 700, and its staff is composed of 26 officials.

The Present Status of the Fruit Industry of the Dominion of Canada

by

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INTRODUCTION.

Historical. — Fruit has been cultivated in Canada since the early part of the 17th century when the French settlers in Acadia, now the Province of Nova Scotia, and also the settlers along the banks of the St. Lawrence in the present Province of Quebec, brought with them seeds and trees from France and planted them. It has, however, been only during the past fifty or sixty years that fruit has been grown to any large extent for commercial purposes.

Kinds cf fruit grown in Canada. — The kinds of fruit grown in Canada for sale are apples, pears, plums, cherries, peaches, apricots, grapes, currants, gooseberries, raspberries, blackberries, loganberries, strawberries and cranberries. There is also a large sale of blueberries and huckleberries which are picked from plants in the wild state.

Fruit districts of Canada. — There is a very large area in Canada suited to the growing of fruit. Apples are grown to the largest extent in the provinces of Ontario, Nova Scotia, Quebec and British Columbia, but they grow well also in the provinces of New Brunswick and Prince Edward Island. The largest number of bearing apple trees is in the Province of Ontario where in 1910 there were 6 544 788 trees and 2 053 302 more trees not yet bearing. In the prairie provinces of Manitoba, Saskatchewan and Alberta tree fruits are not grown except to a limited extent in the most favourable locations, where some apples, crab apples and plums are produced.

The commercial culture of the pear is confined mainly to the provinces of Ontario and British Columbia, though pears succeed well in Nova Scotia, and the hardiest varieties can be grown in Quebec, New Brunswick and Prince Edward Island.

The most favourable climatic conditions for plums are found in Ontario, Nova Scotia and British Columbia, but certain varieties of the Domestica plums can be grown in Prince Edward Island, New Brunswick and Quebec. The native plums *Prunus nigra* and *P. americana* are grown successfully in the colder parts of Canada, and the early varieties succeed in te prairie provinces.

Ontario produces the largest quantity of cherries and they have been planted to a considerable extent in British Columbia, but they are grown successfully also in Nova Scotia and Prince Edward Island and to a limited extent in favoured parts of the Province of Quebec.

Peaches are grown commercially in the south-western part of the province of Ontario and in British Columbia but they can be successfully grown also in the warmer parts of Nova Scotia

The commercial culture of grapes is confined to south-western Ontario, but they can be ripened also in all the other provinces of Canada with the exception of the prairies, where only the very earliest can be got to ripen when grown in the most favourable locations and protected in winter.

Blackberries are grown mainly in Ontario and British Columbia and the culture of loganberries is confined to the warmer parts of British Columbia; but currants, gooseberries, raspberries and strawber ries are grown in all the provinces.

Value of fruit exported from Canada 1912-13. — A large proportion of the fruit grown in Canada is consumed there, but the following figures give the quantity and value of that which was exported during the fiscal year beginnng April 1st, 1912, and ending March 31st, 1913:

	Value — $
Fruits, dried (3 199 539 lbs)	214 442
Apples, green or ripe (1 374 769 barrels)	4 047 806
Berries of all kinds	100 019
Canned and preserved fruits	220 786
Other fruits	96 741
Total fruits exported	4 679 794

VARIETIES AND BREEDING.

Fruits of Canadian origin. — While it is expected that before long a much larger proportion of fruits grown commercially in Canada will be of Canadian origin, at present only a small proportion are such. Some of the best known fruits originated in Canada are:

Apples: Fameuse, McIntosh Red, St. Lawrence, Ontario, New Brunswick, Canada Baldwin, Banks Gravenstein, Swayzie Pomme Grise, Baxter, Trenton, Crimson Beauty.
Peaches: Fitzgerald, Banner, Tyehurst.
Pears: Dempsey, Ritson.
Plums: Glass Seedling, Mount Royal, Raynes.
Cherries: Windsor.
Grapes: Brant, Canada, Moyer, Burnet, Kensington, Jessica.
Raspberries: Herbert, Hilborn, Smith Giant.
Black currants: Saunders, Beauty, Kerry, Magnus, Clipper, Climax, Eagle.
Gooseberries: Pearl, Josselyn (Red Jacket).
Strawberries: Williams.

Fruit breeding. — Fruit breeding was begun in Canada between forty-five and fifty years ago by private persons and several of the varieties mentioned above were the result of hand pollination. During recent years the Federal and Provincial Governments have rendered assistance, and fruit breeding is now an important part of the work at the Central Experimental Farm, Ottawa, Ont., the Horticultural Experiment Station, Jordan Harbor, Ont., and the Ontario Agricultural College, Guelph, Ont. It is at Ottawa, however, that most of the work has so far been done. Cross breeding was begun there in 1894 and over 2000 apple trees have been grown as the result of such work during the past 19 years. A large number of these have fruited and have been propagated and distributed free for test. Since 1890 between 5000 and 6000 apple trees have been raised from seed where only one parent was known. There have been promising seedlings in this lot and 81 have been named. Some 24 000 seedlings of the hardiest apples are being grown at the Federal Stations in the prairie provinces in order to eliminate the tender trees by exposing them to the severe winters, and it is proposed to try much larger numbers. Other fruits which have been used in breeding work are plums, grapes, currants, gooseberries, raspberries and strawberries. The objects in breeding are to obtain hardier good varieties, to extend the cultivation of fruits into colder districts, and to obtain better varieties for the principal fruit districts. Owing to the long distance which is necessary to ship fruit in Canada, varieties having good shipping properties are sought for.

During the last fifteen years records have been kept of the yields of individual apple trees at the Central Experimental Farm, Ottawa, and it has been found that some trees of any one variety planted at the same time and under very similar conditions yield much more than others. Trees have been propagated from heavy and light bearing trees to learn if this habit continues when the trees are grafted. These trees are now beginning to bear and some definitive information is looked for soon.

Cultivation and Marketing.

Methods of culture. — In a country as large as Canada the methods of culture vary somewhat. In the great fruit districts of Ontario and Nova Scotia the practice is to cultivate the orchards until about the middle of July and then to sow seed for a cover crop, such as red or crimson clover, vetch or rape, which will be ploughed in early the following spring. Where the climate is colder it has been found good practice to merely plough the orchard in the spring, harrow it a few times to get the weeds under control, and then sow seed for a clover crop in the month of June. This system is desirable where there is danger of the trees growing too late and being injured by winter. In the province of Quebec many growers prefer to leave their orchards in sod to ensure thorough ripening of the wood before winter. In parts of British Columbia irrigation is practised.

Most of the grapes are grown in the Province of Ontario. The vines are usually planted 10 × 10 feet apart and are tied to a trellis of two or three wires. In many places in Canada where the winter is cold but the summers very warm, grapes are grown for home use by covering the vines with soil during the winter. Except in British Columbia, strawberries are not grown to any extent in the hill system or as single plants as they are in Great Britain and Europe, but in matted rows, the plants being six inches or less apart. By this method the plants protect each other and are not so subject to heaving when the ground freezes, nor is the crown exposed so much to the sun.

Spraying. — Spraying is practised by a large proportion of the fruit growers in Canada. The principal insecticide used for biting insects was Paris green until quite recently, but arsenate of lead is fast taking its place. For San José scale the lime-sulphur wash is used when the trees are dormant. The lime-sulphur is now generally, used for spraying to control certain diseases, such as apple scab and peach leaf curl, when the trees are dormant, and also to some extent during the growing season, although Bordeaux mixture is still commonly used as a summer spray. There is no good means for controlling aphis on tree fruits, although tobacco extracts, soaps and kerosene emulsion are all effective.

Transportation facilities. — The distances to which fruit has to be transported in Canada are in some cases very great, both for the home market and to reach the ports in order that it may be sent abroad, but within about two years there will be three trans-continental railways from the Atlantic to the Pacific oceans, and these, with the many branch lines already in operation, afford excellent means of distributing the fruit. Refrigerator cars are furnished by the railway companies when needed.

Markets. — The home market for Canadian fruits is growing rapidly. There are now about 8 000 000 people in Canada who consume a very large quantity of fruit. In the Prairie provinces where tree fruits do not succeed well and where the main crop is cereals, it is estimated that there are 171 000 square miles suitable for cultivation. This area is being rapidly populated and offers a splendid home market for fruit from the other provinces of Canada. Great Britain and European countries take large quantities of Canadian fruit, as has been shown above.

Co-operation. — The spirit of co-operation in the fruit growing industry is increasing rapidly in Canada, and much has been accomplished in this direction already to assist the fruit grower in getting better prices for his products. In the province of Ontario there are 52 co-operative fruit growers' associations; in Nova Scotia, 32; in Quebec, 8; and in British Columbia, 10. In Nova Scotia, Ontario and British Columbia most of the associations have united to form central selling agencies in order that they may control prices obtained for their fruit. These are known as the United Fruit Co's. Limited, Berwick, N. S.; The Ontario Fruit Growers Limited, Toronto Ont. ; The Okanagan United Growers Limited, Vernon, B. C.

Many of the local co-operative associations are incorporated companies. They buy supplies as well as sell the fruit. In the best organized associations there is a manager who is paid a percentage on the amount of produce handled. There is a central packing house so that the fruit may be uniformly graded. In some cases the returns are pooled and the growers are paid according to the proportion of the different grades of fruit furnished by the producers. In other cases the association ships but does not pack co-operatively and each man's fruit sells on its merits. The officers of a local association usually consist of the president, vice-president, secretary-treasurer, and five directors. There is also a manager on salary, or paid on commission, who supervises the grading and packing and shipping of the fruit and other matters relating to the association.

Legislation. — The Canadian Constitution gives the Federal Government control of certain kinds of agricultural legislation which is interprovincial and effective throughout the whole of Canada. In relation to the fruit industry, for instance, the size of packages in which fruit may be marketed is controlled by the Dominion Government. There are also standards fixed by the Government for the different grades of fruit marketed. The marking on the packages is also regulated by the Government.

Legal barrels, boxes, and baskets in Canada. — The minimum size of the apple barrel in Canada is ninety-six quarts. When apples are packed in boxes for export for sale the inside dimensions of the box must not be less than ten inches deep, eleven inches in width, and twenty inches in length. When apples are packed in boxes or barrels having trays or fillers wherein it is intended to have a separate compartment for each apple, the size of box need not be as above. Boxes for small fruits are two-fifths of a quart and fourt-fifths of a quart. Legal baskets must hold two and two-fifth quarts, six quarts, eleven quarts and fifteen quarts respectively.

Packing and marking fruit. — The name and address of the packer must be stamped on every closed package of fruit. The name of the variety or varieties must be stamped on every closed package of fruit. There must also be a mark indicating the grade of fruit.

Legal grades of apples. — There are four legal grades of apples offered for sale in Canada or exported, namely: Fancy, No. 1, No. 2, and No. 3.

Fancy fruit consists of well-grown specimens of one variety, sound, of uniform and of at least normal size and of good colour for the variety, of normal shape, free from worm holes, bruises, scab and other defects, and properly packed. No. 1 quality is fruit which has no culls and consists of well-grown specimens of one variety, sound, of not less than medium size and of good colour for the variety, of normal shape and not less than ninety per cent. free from scab, worm holes, bruises and other defects, and properly packed. No. 2 quality is fruit which has no culls and consists of specimens of not less than nearly medium size for the variety, and not less than eighty per cent. free from worm holes and such other defects as cause material waste, and properly packed.

The faced or shown surface gives, by law, a false representation of the contents of the package: if more than fifteen per cent. of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such packing.

In regard to fruit imported into Canada: "The Governor in Council by regulation may prescribe the kinds of imported fruit, the packages containing which must be branded or marked", prescribe the brands or marks to be used thereon ; prescribe the manner and places in and at which such fruit is to be inspected and such packages branded or marked.

In order that the above regulations shall be complied with, Inspectors are employed who inspect the fruit at the packing houses, on the markets, at the chief shipping points, and at other places. It is the Inspector's duty to mark any package containing fruit " Falsely Marked ", or " Falsely Packed", if it does not comply with the regulations. There are also fines for improper packing and marking.

GOVERNMENT AID TO FRUIT GROWERS.

Colleges. — There are four Agricultual Colleges at which a four years, course in agriculture is given and from which, or through the Universities with which they are affiliated, the graduates receive the degree of Bachelor of the Science of Agriculture (B. S. A.). These colleges are the Ontario Agricultural College, Guelph, Ont.; the Macdonald College, Macdonald College, Que.; the Trappist College, La Trappe, Que.; and the Manitoba Agricultural College, Winnipeg, Man. At these colleges the students receive a special course in horticulture. There is also the Maritime Agricultural College, Truro, N. S., at which the students are given a two years' course in agriculture and horticulture, and an Agricultural School at Ste. Anne de la Pocatiere, Que. In connection with the Agricultural Colleges, short courses in horticulture lasting from one to two weeks are given. These colleges are supported mainly by the provincial governments and by private gift, but the Federal Government also gives some assistance.

Experimental Farms. — There are sixteen Experimental Farms or Stations in Canada supported by the Federal Government, of which the Central Farm is at Ottawa, Ont. The appropriation for the maintenance of these and for new farms is this year $810,000, exclusive of salaries of the permanent staff.

At the Experimental Stations experiments in methods of culture, tests of varieties, spraying and plant breeding are carried on in order to aid the fruit growers in the different provinces. The divisions of Chemistry. Entomology and Botany, with headquarters at the Central Farm at Ottawa, lend their aid in the more scientific aspects of horticulture. The Farms are bureaus of information to which fruit growers may write and receive replies without any cost to themselves. Annual reports and bulletins are published giving an account of the work done. There are also experimental farms associated with the provincial agricultural college.

District or County Instructors. — In the provinces of Ontario, Quebec and British Columbia the provincial governments have instructors or district representatives whose duty it is to go through the country and give free information and instruction to farmers and fruit growers and in some cases to carry on demonstrations of the best methods of orchard practice. They have their headquarters, where people may come to get information or where they may write for it. In the province of Ontario there are now 31 representatives and an almost equal number of assistants.

Demonstration Orchards. —In the provinces of Nova Scotia, New Brunswick, Prince Edward Island and British Columbia there are small orchards of from one to five acres to demonstrate the best varieties and methods of culture. There are, for instance, 35 of these in Nova Scotia and 23 in New Brunswick. The provincial government furnishes the trees free and sends a man to plant them, the owner caring for the trees according to directions for ten years or more. The Government also sometimes supplies a spray pump.

Exhibitions. — The Governments, both Federal and Provincial, aid the fruit grower by assisting in making exhibits of fruits both in Canada and in other countries, in order to advertise the good quality of Canadian fruit and thus help to find markets for it. Rules for judging fruits have been adopted by several of the provincial fruit-growers' associations.

Packing Demonstrations.—Both the Federal and Provincial Governments aid the fruit grower by giving demonstrations by expert packers in packing fruit. Last winter, for instance, 40 such demonstrations or schools were conducted in the province of British Columbia alone.

Cold Storage and Markets. — The General Government aids the fruit grower by helping him to get his products to market in good condition. For the shipment of fruit in refrigerator car loads intended for export, the Government pays icing charges to the extent of $ 5.00 per car. Arrangements are also made by the Government to have small cold-storage chambers on steamships reserved for the carriage of fruit only. This has resulted in a large increase in the amount of tender fruit exported. Temperature records are kept by the Government on the steamers carrying fruit in order to ensure its being well looked after, and inspectors are employed by the Government to inspect the cargoes both on steamers and in refrigerator cars.

Subsidies are also given by the Government to aid in the erection of cold-storage plants throughout Canada. And also in the precooling of fruits before shipment.

Protection against diseases and injurious insects. — There is an Act of Parliament known as the "Destructive Insect and Pest Act" which empowers the Government to inspect fruit trees coming from other countries into Canada, and to fumigate them at stations controlled by the Federal Government. The Provincial Governments also have laws within the provinces giving them power to inspect trees in nurseries and to enforce fumigation before shipment from the nurseries. Inspectors of the Entomological Division and Botanical Division of the Department of Agriculture, and men employed by the Provincial Government, spend much time in the orchards seeking information in regard to any injurious insects and diseases and finding methods of controlling them.

Fruit-Growers' Associations — There are seven provincial fruit-growers' associations in Canada in the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia. These associations are supported in part by the Provincial Governments. Subjects relating to the fruit industry are discussed at their annual meetings, which last about two days. They are powerful agents in bringing about needed legislation in regard to the fruit industry. From time to time representatives of these associations meet at Ottawa in a Dominion Conference in which matters affecting legislation for the whole of Canada are discussed.

Fruit Crop Report. — A monthly report on the condition of the fruit crop in Canada and in other countries is published by the Federal Government during the growing season. Newspaper reports are also issued from time to time. The information for these reports is gathered from a large number of fruit growers throughout Canada. The Provincial Governments also issue reports.

Bulletins and Periodicals. — In addition to the report and bulletins which are published by the Dominion and Provincial Governments, and which are furnished free to anyone who asks for them, there are several horticultural periodicals published by private companies in Canada which devote considerable space to fruit culture.

Canning Factories — Much fruit is canned in Canada and new factories are starting from time to time, and there is every prospect that this phase of the fruit industry will develop very much.

In conclusion we beg to state that the outlook for fruit growing in Canada is good. The areas where fruit can be successfully grown are, in the case of the apple particularly, so great that if a large proportion were planted Canada could supply the world for a long time to come. What is needed is good organization and good distribution all over Canada in order to avoid gluts and these conditions give greater promise of fulfilment every year.

Elements for the Valuation of Fruit Trees

by

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It is only quite recently that fruit trees have begun to be considered as a revenue-bearing capital, the value of which can be ascertained only by knowing the value, expressed in money, of the crops yielded by them every year or in longer periods. The methods hitherto adopted for the determination of the value of fruit trees were based on very vague estimations, which in cases of the sale of orchards or of individual trees led mostly to very low figures or in other words to the disadvantage of the vendor.

In order to introduce the above criterium into practice, it became necessary to procure that basis which rendered it possible to get, in figures, the complex factors involved ; it consisted in the main in determining the most reliable average figures concerning the greatest age of the fruit trees, the commencement of their bearing, and the yields in fruit or in money which the trees can give in the whole course of their life. The few data to be found in the literature bearing on this subject were not satisfactory, owing to their being partly improbable. It was thus advisable to take steps to get reliable figures which would also be of use in revising existing older observations. In collaboration with the " Austrian Fruit-growers' Association " of Vienna, I have undertaken the not easy task of examining and arranging the figures obtained from prominent and trustworhytfruit growers, living at a distance from each other. I cannot enter here into the details of this work which I have treated exhaustively in the " *Verhandlungen der zweiten Tagung der Oesterreichischen Obstbau- und Pomologen-Gesellschaft* ", Vienna 1911. I shall give instead the chief results of my research, together with a brief discussion of the same. In the same reports there is another paper of mine under the title " A valuation of fruit trees based on new considerations ", which I mention because the two papers are connected and complete each other.

The following summary is based on 41 trustworthy reports made in different countries, and gives information, referred to standards, half-standards, bush trees and other forms, on those three main questions which have been considered the foundation of the valuation of fruit trees. For the sake of comparison, the accompanying table (p. 1821) includes those figures, mainly taken from the works of Prof. Christ and E. Junge (*Anleitung für die Wertund Rentabilitätsberechnung von Obstkulturen.* Berlin, 1905. P. Parey), which have hitherto been accepted as reliable.

The table gives, for bush trees and other forms not standards or half-standards, a series of indications regarding beginning of bearing, highest age, and total yield which were previously not available.

With standards and half-standards it appears that, except for walnuts, there is not much difference between the new and the old data respecting the age at which the trees begin to bear. On the contrary, with but few exceptions, the average figures for greatest age and total yield hitherto accepted are shown to be too low. The exceptions are in the greatest age of the pear and the total yield of the plum.

I am quite aware that, especially in questions relating to yield, fixed figures should not be used, but sometimes it is necessary to use some useful average figures and particularly in the valuation of fruit trees it is impossible to do without them. Of course the averages adopted must be recognized by expert circles. This is the case here, for the members of the Austrian Fruit-growers' Association have unanimously decided to consider for the present the average figures given in the table as trustworthy.

A very important premise for a possibly exact valuation of fruit trees is the correct knowledge of their age. Usually this is not known, and the valuations to which recourse had to be had until recently gave very doubtful results, as was often subsequently proved by felling the trees.

By considering the average annual increase of the circumference of the stem, measured at a height of 3ft. 3 in. from the ground, a means has been now found of avoiding gross errors in the estimation of the age of standards

Summary of General Averages, compared with the data hitherto accepted.

Kind of fruit	Bush trees and other forms						Standards and half-standards					
	Commencement of bearing		Highest age		Total yield of fruit during life of tree		Commencement of bearing		Highest age		Total yield of fruit during life of tree	
	Average						Average					
	Hithrto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hithesto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hithesto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry
					lbs.	lbs.					lbs.	lbs.
Apple	4	4	33	30	678	1100	10	8	60	70	3630	5200
Pear	4	4	33	30	1150	1080	8	8	80	80	5400	7220
Quince	—	5	—	30	—	690	—	6	—	35	—	770
Medlar	—	4	—	40	—	385	—	5	—	40	—	715
Plum	—	5	—	30	—	850 to 1050	5	5	30	35 to 40	1320 to 1760	1550
Cherry	—	5	—	30	—	800	6	6	40	60	2062	2280
Morello	—	4	—	25	—	600	5	5	30	40	1350	2350
Peach	3	4	12	15	175	300	—	4	—	15	—	350
Apricot	—	3	—	20	—	550	4	4	20	25	690	895
Walnut	—	—	—	—	—	—	20	12	100	105	3630	4420
Hazel	—	5	—	35	—	155	—	—	—	—	—	—
Chestnut	—	—	—	—	—	—	—	12	—	120	—	6630
Red currant	3	3	16	20	110	200	—	3	—	10	—	100
Gooseberry	3	3	16	15	82	190	—	3	—	15	—	100

and half-standards. Prof. Steglich has done much work in this connection and I also for many years have been occupied with the subject.

Under normal conditions of vegetation the average annual increase of the circumference of the stem is:

	cm.	in.
Apple and Apricot	2.0	0.8
Walnut	2.5	1.0
Pear and Plum	3.0	1.2
Cherry and Morello	4.0	1.6

Thus, for instance, a cherry tree measuring 40 cm. (15.7 in.) in circumference at a height of 3ft. 3 in. would be ten years old, while an apple tree of the same girth would be 20 years old. If the conditions of growth, such as soil, position and climate, be duly taken into account, experience has shown that the error is reduced within such limits as not to have much effect upon the valuation of the trees under discussion.

The above-mentioned basis allows us to work out a useful valuation of trees. This calculation, which is based upon the special considerations of my colleague Herr. I. Gürther, is however complicated and requires much preparatory knowledge. I have therefore suggested to my above-named collaborator and my former assistant Herr Th. Horn to draw up some tables, at least for standards and half-standards of the most important fruit trees, which should allow of the money value of the trees grown under normal conditions being read straight off as soon their age was known or determined. These tables have been inserted in the reports of the transactions of the second meeting of the Austrian Fruit-growers' Association held in Vienna in 1911.

The Distribution of Forests in the Natural Regions of Switzerland

by

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Switzerland is divided topographically into three regions: the Jura, the Plain and the Alps. This division is equally in accordance with oro-geological structure. The regions are also important from the point of view of the forests; thus, if we take the available statistics, we find that the grouping of the wooded land is very different in the three regions mentioned. In the present article I shall limit myself to a brief description of the forest character of each of these natural divisions.

The *Jura* rises in a steep and even slope from the plain to a considerable height, especially in its western part; but it rarely passes the upper limit of the forests. Its wide rolling top, formed of plateaus only cut up by small valleys and coombes, is almost entirely without water, owing to the nature of the rocks. For this reason habitations are few and always occur near springs in the larger valleys; the Jura villages are chiefly industrial, and often of considerable size.

In the Jura, as elsewhere, the altitude determines the occurrence of distinct zones of vegetation; topographical conditions and the nature of the soil modify the distribution of moisture and heat sufficiently to give rise to various stations characterized by well-defined plant formations. According to altitude, three zones are distinguished: the *lower zone* roughly from

400 to 700 m. (1300 to 2300 ft.), in which cereals and walnuts, and even vines, still thrive; the *middle* or *montane zone* from 700 to 1300 m. (2300 to 4300 ft.), largely occupied by forests, meadows and moors; the *upper* or *subalpine zone*, from 1300 m. (4300 ft.) upwards, occupied by the upper limit of the forests (which hardly pass 1400 m. = 4650 ft.) and the pastures which cover all the high ridges.

Altitude is a very important factor in the distribution of forests. These occupy the bulk of the zone between 700 and 1300 m; indeed, of all the plant formations for the Jura, forest undoubtedly occupies the largest area and plays the leading part in determining the physiognomy. Further, the proportion of waste ground is far and away smaller in this region than in the Alps. The result of these circumstances is that the cantons belonging essentially to the Jura are among the best wooded in Switzerland: Schaffhausen has 42.6 per cent. of its total area and 44.6 per cent. of the productive soil under forest; in Solothurn these figures are 36.7 and 38.2, and in Neuchâtel 30.9 and 36.1.

In general also it is in the Jura that the forests are most extensive and thickest; dividing up of land is much less advanced than in other parts of Switzerland. The slopes are generally uniformly wooded over long distances, while on the plateaus, which are particularly numerous in the south, frequently only blocks of wood remain. The forest map of Switzerland shows an almost uninterrupted wooded belt marking the whole extent of the Jura from Geneva to Schaffhausen, for a length of 150 miles, with an average width of 12 miles.

The Swiss *Alps* form a segment of the great arc of Central Europe. For the vertical distribution of vegetation the following altitudinal zones are generally distinguished: the *hill region*, 200 to 700 m. (650 to 2300 ft.), which is the true agricultural region; the *montane region*, 700 to 1200 m. (2300 to 4000 ft.), whose characteristic is forests of broad-leaved and coniferous trees mixed; the *alpine region* 1200 to 2600 m. (4000 to 8600 ft.), whose lower part contains conifer forests and pastures, while the upper part is purely pasture, though sometimes with some trees on it; the *region of eternal snow* comprising the heights above 2600 m.

The proportion of forest is generally less in the Alpine cantons than in the Jura. Contrary to what one might at first sight suppose, agriculture has taken a hold there and maintained itself better; this is due on the one hand to the wide protecting forest belt, and on the other to the configuration and the nature of the soil.

The crystalline rocks decompose readily; they generally give a deep soil, which holds moisture and is fertile; they contribute to rounding off and softening of the surface of the land. Further, this land is rarely lacking in springs, for the rocks make good beds for throwing out the rain and snow-water soaking down from above. Colonization has thus been possible almost everywhere in the Alps: from the chief villages in the valleys, hamlets have split off here and there at different heights where there are springs;

higher up there are the " mayens" and " mazots " (1) on the lower mountains; further up still, isolated chalets occur on the alpine pastures.

Man has thus established himself to some extent wherever favourable conditions were found: the forest has had to give way to him; it has been heavily cleared to a great height to make way for the crops of the mountaineer. The present-day forests are mostly only more or less extensive remnants of those which covered these regions before the advent of man. Fire and axe have further increased the space required by the mountaineer, and his goats and sheep have completed the work. Forest was often cleared even from places where its presence was really essential.

Besides this, a considerable extent of land is unproductive owing to its position. Indeed the forest has had to struggle not only against the repeated attacks of man, but against the ravages of avalanches, rock-falls and torrents. For all these reasons, the proportion of land under forests in the Alps is often very low, a fact which is very often due to the natural causes of a climatic or edaphic nature; the forests are restricted to the soils least suitable to agriculture from lack of fertility or from position. Thus the best wooded canton, Lower Unterwald, has only 23.9 per cent. of its total area and 31.9 per cent. of its productive area under forest; in Valais these figures fall to 14.7 and 26.7.

The dividing up of the forests has also been influenced by these facts. The chief woods extend along the sides of the valleys, forming a wider or narrower belt, varying according to aspect and shape of the ground. Steep slopes reaching right down to the torrrents, and those facing north, may be wooded throughout; in this case the forest reaches from the thalweg right up to the limit of tree-growth. On gentle slopes, and particularly on the south aspects, forests have largely given place to field crops; on the steeper south-facing slopes, however, forests re appear above a certain height, but here again any less steep parts or shoulders are under cultivation. The upper region of the high mountains is given over to pasture, often with the more or less scanty tree growth of the meadow-woods and wooded pastures. Higher up, only the last outliers of woody growth occur, and they give place to the vast zone of subalpine turf, followed by waste land, rocks and glaciers.

The *Plateau* is the region between the Jura and the Alps; from the cilmatic point of view it may be considered the most favoured of the three natural regions of Switzerland because it is the least elevated. Its configuration, however, hardly justifies the title of plateau; thus the name of " hill country " (" Hügelland " and " Mittelland ") seems more logical.

It is difficult to get a general idea of the distribution of forests in the intermediate region. The cantons between the Jura and the Alps, on " diluvium " and " molasse," many of them reach up onto the Jurassic plain or else include part of the Alps or Prealps ; the political divisions thus do not correspond with the natural ones. The situation and distribution of the forests can be judged more or less from what has already been said. In the region of the " molasse " and the glacial deposits, the ridges between the valleys are mostly covered by dense forest masses, while the slopes, especially those facing south, are given over to agriculture, unless their steepness or lack of fertility makes wood preferable. In the Prealps, where the " nagelfluh " predominates, and where private woods are often abundant owing to the splitting up of the ancient communal properties, only small patches of wood occur scattered in the fields.

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(1) " **Mayens** " are the half-way houses occup'ed by the herdsmen in early summer and autumn, before and after the alpine grazing season; " mazots " are barns or store-houses. (*Ed.*).

The plateau region is the most thickly populated in Switzerland : indeed 60 per cent. of the total population of the country lives in this intermediate region, though it only occupies 29 per cent. of the surface; it is five-and-a-half times as thickly populated as the Alps. This fact has a great influence on the distribution of the forests and the percentage area under forest in the different regions. Indeed the very varied utilization of the soil that we remark is by no means arbitrary ; it is a factor of the topographical and climatic conditions of the country, which the farmer must take into account in order to get the best yield from the soil; the plain and plateau regions of Switzerland are those in which woods occupy the least extent of cultivable surface : the canton of Geneva has 11.2 per cent. of its productive land under forests, making 9.1 per cent. of the total area ; in Bâle-Town these figures are 20 per cent. and 16.1 per cent. Further, subdivision has led to the woods occurring as many small stands. The character of the proprietors has also some importance on the distribution of the woods. In general the more public forests there are, the larger is the area and the better the arrangement of the individual woods, which then often cover considerable areas which might be profitably put under crops.

Switzerland at present possesses something near 2 ½ million acres of forests, distributed among the three regions as follows :

Jura	20	per cent.
Plateau	25	»
Mountains	55	»

In other words, more than half the Swiss forests occur in the Alps, a quarter in the Plateau, and a fifth in the Jura. The percentage of wooding in the three natural regions is approximately 33 in the Jura, 22 in the Plateau and 17 in the Alps.

We may perhaps be able to return on a future occasion to certain conclusions which occur to one when one considers the international importance of forests in the region of the sources of certain great European rivers.

Recent Experience and Progress in Dairying in Germany

by

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During the last decades, dairying in Germany, thanks to the constant extension and improvement of cattle keeping, has developed to such an extent that the yearly production of milk is now worth about £ 150 000 000 in round numbers and is consequently superior in value to the bread stuffs, which in 1909 amounted to £ 141 000 000. Notwithstanding the extraordinary increase of milk production, it has not been able quite to keep pace with the rapid increase of population, which is in round numbers 900 000 per annum. For whilst in 1871 the German Empire had an excess of dairy products and exported about £ 1 912 000 worth, since 1896 it has been obliged every year to import increasing quantities from abroad in order to meet demands. In 1912 the excess of importation amounted already to £ 9 617 650, or 6.5 per cent. of the home production. It behoves cattle breeders to increase still further the milk yield of the cows, in order to render Germany independent of foreign countries. As for the dairy products imported, it is especially to be mentioned that the introduction of cream during the last decades has attained a most unexpected importance. This is connected with the fact that, while, according to existing tariffs, butter pays a duty of about 10s per cwt., milk and cream are duty free.

The number of cows at present existing in Germany is in round numbers 11 millions. If the average milk yield per cow be taken at 506 gallons (2 300 litres) per annum, the total amount of milk produced every year is about 5 566 million gallons. In the large towns the daily consumption of milk per inhabitant ranges from 0.39 to 0.72 pint per day. In the smaller towns the consumption is greater and in the country it is still more so. On an average 0.79 pint per head per day may be taken, or 36.8 gallons per annum. With a population of 67 millions in round numbers, this amounts to a consumption of 2417 million gallons, which is 43 per cent. of the whole quantity of milk produced. If it be further assumed on the strength of careful calculation that the rearing and fattening of calves absorbs 445 million gallons, or 8 per cent. of the milk produced, it is evident that at present only about 49 per cent. remains for the preparation of butter and cheese.

In milking and in the further handling and working up of the milk, it is sought as far as possible to conform to hygienic rules. The stables are arranged with a view to keeping the cows clean and the milk as wholesome as possible. While formerly in some stables the dung was allowed to remain under the cattle, now the Dutch system of stabling prevails, in which a gutter for the reception of the droppings runs along the back of the stalls and is cleaned out every day.

In order to judge whether the milk delivered by the cow-sheds has been obtained with due regard to cleanliness, the larger dairies test the milk of each farm daily for cleanliness. The reductase test is also frequently adopted, as it allows an opinion to be formed as to the number and kind of bacteria present in each consignment of milk.

With the object of meeting the just demand that all the milk put on the market be wholesome and above all free from tubercle bacilli, the East Prussian Dutch Herdbook Association adopted in 1900 suitable measures, being the first in the whole world to do so. In the East of Prussia this example was soon followed by cooperative dairies, control and cattle breeding associations, etc., so that in the above province at the present time no less than 82 000 animals above two years of age are submitted to the tuberculin test. The total number of animals (including young animals and calves) in the herds which are submitted to these measures is about 200 000.

From East Prussia the voluntary control of cattle tuberculosis spread to almost all the provinces and has also gained a sure footing abroad: in Holland, Russia, etc. The State control of tuberculosis is based chiefly upon the experience gained in East Prussia; it came into force on May 1, 1912, in the new law on cattle diseases.

Some farms already use milking machines. Though it is undeniable that of late years they have been much improved, I am of opinion that they can never take the place of a good milker and can only be considered as a resource in time of need which is useful when no suitable hands can be engaged. It must not be forgotten that the high production of milk of our cows is not a gift of nature, but rather a quality which has been artificially induced in them to a great extent by the stimulus of hand milking. No milking machine is capable of handling an udder like an experienced milker, nor is it capable of considering the individuality of each animal. So important is this question, that all the efforts made in the several districts for the improvement of hand milking and the institution of milking schools should not be neglected but unweariedly furthered.

The so-called control associations, whose task it is to determine the quantity of milk produced by the individual cows of their members, and its fat content, together with the corresponding quantities of fodder consumed, have spread very rapidly. In the kingdom of Prussia there are at present about 500 such associations in existence, with a membership of 7 500 farmers, possessing 220 000 cows. That this system of control is one of the most powerful factors in the improvement of the milk yield of our cows is now generally recognized.

Among the various ways of utilizing milk, the direct consumption as human food has, during the last decades, increased considerably; at present, as already stated, it accounts for 43 per cent. of all the milk produced. During late years a number of labourers' families have left the country, where they were provided with milk from the cows they kept, and have taken up their abode in large towns and industrial centres, remaining consumers of milk. Not only the absolute consumption of milk, but the relative consumption per inhabitant has increased, as is proved by statistics. As for the causes of this fact, they are to be sought in the anti-alcohol agitation which has reached the working classes; in the successful propaganda for increasing the consumption of milk, which was started about 10 years ago, in the retail sale of milk in factories, schools and in the milk booths in the streets, and most of all in the higher wages of workmen and their better living. This increase of milk consumption is a matter of satisfaction, as it makes for the better and cheaper feeding of the people: the most valuable food stuff, protein, is four times as cheap in milk as in meat.

With the constant growth of large towns, the task of providing them with milk becomes increasingly difficult, as it has to be conveyed from greater distances. In such cases the milking is carried out with the utmoss cleanliness, the milk is immediately passed through a cottonwool filter and cooled to 1 to 3° C. (34 to 39° F). During carriage it is kept as cool as possible. None of the other proposed methods for preserving milk have proved advantageous in practice.

If, during the last ten years, the milk supply of large towns has so considerably improved, and the mortality of infants has sensibly diminished, it is to a great extent due to the fact that in large towns the sale of milk is carried on by large firms whose arrangements are in harmony with modern requirements and who earnestly strive to conform to the best of their ability to the dictates of hygiene; all the herds which supply them with milk are submitted to the anti-tuberculous process recognized by the State, the milk on delivery is carefully examined as to its cleanliness, freshness, degree of acidity, fat content, etc.; it is cleaned by centrifugation, then pasteurized in order to destroy any germs of disease it may contain and to improve its keeping qualities, after which it is cooled by means of ice machines and kept at a low temperature till sent off. The consumer gets the milk sent to him in carts so constructed that any tampering with the milk by the carrier is rendered impossible. A certain amount of milk is sold in suitably closed bottles. As the great majority of our babies just in the most critical period of their existence are not suckled by their mothers but nourished on cows' milk, it is of the highest economic importance that this food should reach the consumer in the best possible condition, and this can only be accomplished by well appointed large firms, which thus act as institutions for the protection of babies.

In the working up of milk the first thing to be noted is that the improvement of milk separators, which are the most important dairy machines, is being continously and actively pursued. The number of separators at work in Germany is over 370 000. They are to be met with not only where butter is made, but also in many farms which send the separated cream to the dairies. This production of cream has spread, especially in those districts where large estates are prevalent. In the large butter factories all the improved methods suggested by science and practice are adopted;

the cream is pasteurized in order to improve the quality and keeping of the butter and to obviate the unfavourable influence of certain fodders; the factories start it with pure cultures of lactic acid bacteria and cause the acidification to take place in so-called cream ripeners, which allow the temperature to be regulated to a nicety; they use churns in which the butter is made and worked up, and with which even large firms can churn all their cream in one operation, as in the largest of these churns (Butterfertiger) as much as 440 gallons of cream can be worked at a time. Apart from other advantages, they lead also to a great saving of time and labour.

The efforts of the dairies to improve the quality of their product are all the more satisfactory as foreign competition becomes keener every year, so that in many quarters the demand arises for the introduction of a trade mark for home butter. The granting of a patent for the "Friwi" butter-making process has caused dissatisfaction in the trade; this process consists essentially in maintaining the cream about 24 hours near freezing point, then warming it to 18 or 20° C. (64 to 68° F.) and mixing it with 10 per cent. of starter; this addition is repeated after 4 to 6 hours and then the cream is cooled to 10 to 13° C. (50 to 55° F.) and allowed to ripen at this temperature for about 18 or 20 hours, so that it is 48 hours old when it is churned. It seems difficult to understand how a process so long known could have been patented. As it does not lead to a greater yield of butter, it is not likely that many dairies would be inclined to pay royalties for it.

In cheese making also notable progress has been made, but this branch of dairying has not undergone so deep a change as butter making. Of the hundreds of dairies which have arisen during the last decades, only a relatively small number makes cheeses, because this industry is attended with greater risks; it is also more exacting as to the composition of the milk, it requires more labour and pains, greater knowledge and experience and lastly its products are not immediately saleable like butter.

In North Germany it is only in a few localities that many cheese dairies are to be found; such are the fertile plains of East and West Prussia and the Rhine province. During recent decades more interest has been awakened in cheese making in Schleswig-Holstein than was formerly the case. In the rest of Germany cheese dairies are found isolated. In South Germany any cheese making is much more important, especially in Bavarian Allgäu.

In West and Central Germany there are a number of curd cheese (Quargkäse) factories; these, however, are not considered as real cheese dairies because they only buy the freshly pressed curd from the dairies and work it up into several kinds of sour cheeses. Though these cheeses have only a low value, they are not to be despised as food for the people. It is further worthy of mention that the production of imitations of French soft cheeses, such as Camembert, Brie and Neufchâtel, is increasingly practised; as in these cheeses the milk fetches high prices it is a tendency to be welcomed. Considering that a dishonest competition has made itself felt in the cheese trade, efforts are being made to prevent cheeses made from skimmed milk being sold as half-fat cheeses, or these latter as whole-milk or cream cheeses.

The preparation of milk powder or dried milk, which has been known since the middle of the last century, has developed of late years, especially in East Prussia. It is connected with the rapid rise of the chocolate industry, as the dried milk is chiefly used in the preparation of milk-chocolate, cakes and biscuits, besides being used in the household for puddings. It is, however, no substitute for fresh milk as its makers claim. In this respect it is decidedly inferior to condensed milk, which next to butter and cheese is the most important milk product and serves especially for consumption on board ship and in the tropics. Unfortunately, it is still produced only in small quantities in Germany. As in condensing milk only a portion of the water is subtracted, the casein has not lost its power of dissolving in water, so that this product, by the mere addition of water, can be reconverted into milk. It can thus be utilized in many more ways than milk powder and has an immensely larger market ready for it, while the rapidly increased production of milk powder seems to have already outpaced the demand.

Recently the extraction of casein from skimmed milk has somewhat increased. It is used in the industries and also in the preparation of articles of food. Among the former, paper, colours and adhesives are the chief; when treated with metal salts and formaldehyde, galalith is the result; this, according to the substances added, gives a good imitation of celluloid, ivory, coral, tortoiseshell, etc. It is easily worked and polished and is not inflammable like celluloid. From casein, artificial silk and horsehair, films and shoe creams are made. Besides the above, a whole series of food preparations are based on casein: nutrose, eukasin, sanose, sanatogen, plasmon, eulactol, etc., which are sold at disproportionally high prices; thus for instance one pound of sanatogen costs 13*s* 4*d*.

From skimmed milk a substitute for Liebig's extract of meat can also be made; the process is based on the fact that in the ash of milk the same substances are found as in meat. Hitherto, however, this process has not been applied to any great extent. A few dairies prepare milk soap from condensed skimmed milk.

Some large cheese factories find it profitable to extract the milk sugar contained in their whey; this sugar is used in the preparation of medicines, in the nourishement of infants and in the industries. One factory prepares lactic acid from whey.

To the formerly known lactic acid beverages, kéfir and kumiss, another has lately been added, namely yoghurt. The use of this has spread very much, as it is credited with preventing infection of the intestines and being consequently conducive to health. Yoghurt, as is well known, is the national beverage of the Bulgarians. As a proof that the daily regular use of Yoghurt is especially wholesome, it is stated that in Bulgaria with its 4.3 million inhabitants there are more nonagenarians than in the whole of the German Empire.

That dairying in Germany is in a most flourishing condition, that it has already achieved extraordinary progress and that this is due to the unceasing activity of dairy advisers, teachers and experts, is admitted by every one. What investigators in this field justly complain of is the want of a sufficiently endowed central institute capable of solving several serious problems. Institutes existing at present cannot cope with many questions, being handicapped by want of time, of sufficient staff, of experimental stabling and cattle, of a dairy entirely at the disposal of investigators, and, last but not least, by the want of money. This want is all the more to be regretted as other agricultural industries such as brewing, distilling, starch and wine making, beet sugar manufacturing and milling, which, more than dairying, have emancipated themselves from farming, have possessed for a long time past such central institutes, notwithstanding that the value of their produce is considerably less than that of dairying. Much smaller States, such as Holland, Sweden, Switzerland and several States of the North American Republic, are in this respect much better off than Germany. The demand for an imperial institute for dairying will have to be regarded as completely justified.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1313 - **Swiss Law of June 9, 1913, concerning the Control of the Commerce in Manures, Feeding Stuffs, Seeds and other Products useful to Agriculture and Allied Industries, by the Federal Stations of Agricultural Experiment and Analysis.** (Verordnung betreffend die Ueberwachung des Handels mit Dungemitteln, Futtergemitteln, Sämereien und andern in der Landwirtschaft und deren Nebengewerben Verwendung findenden Hilfsstoffen durch die Schweizerischen Landwirtschaftlichen Versuchs-und Untersuchungsanstalgten — Vom 9 Juni 1913. — SCHULTHESS (Département fédéral de l'Agriculture). — *Landwirtschaftliches Jahrbuch der Schweiz,* Year XXVII, Part 5, pp. 309-324. Berne, 1913.

The Commission of Control of the Stations of Agricultural Experiments and Analyses of the Federal Department of Agriculture has considered and approved a law for the control of the trade in feeding-stuffs and manures. This law will come into force on the first of January 1914 and will supersede the law of the tenth of June 1903.

The chief points dealt with are as follows:

General Provisions:

§ 1. Firms under control and their certificates of guarantee.

§ 2. Procedure required for certification.

Special Provisions:

A. Inspection of trade in manures, forage crops and other materials.

I. *Control analyses.*

§ 3. Control fees.

§ 4. Guarantees.

§ 5. Gratuitous analyses. Control certificates.

§ 6. Drawing and despatch of samples.

§ 7. Results of analysis.

§ 8. Appeals.

§ 9. Indemnities.

II. *Other Analyses.*
  § 10. Despatch of samples.
  § 11. Scale of charges.
  § 12. Reduction of prices.
  B. Protection of trade in seeds.
I. *Control Analyses.*
  § 13 Control Fees.
  § 14. Guarantees.
  § 15. Gratuitous analyses. Control certificates.
  § 16. Drawing and despatch of samples.
  § 17. Results of analysis.
  § 18. Appeals.
  § 19. Indemnities.
  § 20. Selectors and establishments for seed-selection in Switzerland.
II. *Other Analyses.*
  § 21. Despatch of samples.
  § 22. Scale of charges.
  § 23. Reduction of prices.
  C. Conference of experts on questions connected with the Control.
  § 24. Aim.
  § 25. Composition.
  § 26. Powers.

This law concerns chiefly manufacturers, companies, merchants and persons with an interest in the control certificates. Its provisions are effected by the Central Administration of Swiss Stations of Agricultural Experiments and Analyses at Liebefeld, near Berne, with the object of controlling the trade in manures, fodder and other materials used in agriculture. The firms which reap the advantages shall be known as "controlled firms" (1).

The conditions of the contract are as follows:

(*a*) Controlled firms undertake to observe in every point the provisions of the law.

(*b*) They undertake to indicate, in compliance with the law, the guarantees of all goods sold, and to deliver gratuitously to their customers the certificate of control filled in according to instructions.

(*c*) The purchasers of goods from a controlled firm have the right to a gratuitous analysis from the Federal authorities above-mentioned, under the conditions stipulated in the law and without further formalities.

(*d*) The controlled firms shall recognise the analyses made by the authorities as final for regulating the price for the purchasers except in the case of appeal; when the analysis shows composition inferior to that guaranteed, they shall indemnify the purchaser.

The controlled firms shall undertake to describe their products and are forbidden to use names likely to lead to a misunderstanding of their real value on the part of the purchaser. They are also forbidden to put on the market products of secret composition. Each year the Administration will publish a list of the firms controlled and the products sold by them. Firms which do not submit to regular control or continue to place inferior products on the market will be removed from this list. (See § 1).

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(1) This principle is already in force in several of the United States of America, and is incorporated in the "Model Fertilizer Law" proposed by Hopkins and conforming to the views of the Association of American Agricultural Colleges and Experiment Stations. (See *Proceedings XII Annual Convention*, p. 128, 1906; *Proceedings XXIV Convention of the Association of Official Agricultural Chemists*, p. 100, 1907, and HOPKINS, C. G., *Soil Fertility and Permanent Agriculture*, Appendix, p. 599, 1910). (*Ed.*).

The annual revenue of the control service is estimated on a basis of every 10 metric tons of produce sold to purchasers resident in Switzerland at the rate of 1.50 frs. (1*s* 3*d*) for manures containing a single fertilising ingredient and 2.50 frs. (2*s*) for mixed manures and feeding-stuffs, with a minimum of 50 francs (£2) in the case of Swiss firms. On foreign firms the taxes are respectively 2.50 (2*s*) and 3 frs. (2*s* 6*d*), and the minimum 100 francs (£4). The annual amount due must be paid before January 10 of the following year, reduction of 20 per cent. being allowed for quantities exceeding 500 wagons. In the case of seeds the annual control tax will be fixed by contract, the minimum being 25 francs (£1) for Swiss firms and 50 frs. (£2) for foreign firms, the amount to be paid in advance. (See § 3 and § 13).

The guarantees given by the controlled firms for goods sold must comprise :

In the case of manures :

(*a*) Purity and freedom from adulterations ; suitability of texture.

(*b*) Freedom from substances injurious to plants.

(*c*) The content of useful constituents, indicated as percentage, when the purchase of the goods is not made on the results of the analysis.

The guarantees of quality and composition refer to :

water-soluble phosphoric acid (P_2O_5) ;
ammonium-citrate soluble phosphoric acid (P_2O_5) ;
citric-acid soluble phosphoric acid (P_2O_5) ;
nitrogen as ammonia (N) ;
nitric nitrogen (N) ;
organic nitrogen (N) ;
total nitrogen (N) ;
water-soluble potash (K_2O) ;
lime (CaO) ;
other substances as required ;
the fineness of grinding ;
suitability for spreading ; degree of dryness and physical condition (fine or coarse).

The minimum composition must be :

superphosphates : 10 per cent. water-soluble phosphoric acid.
mixed superphosphates : 4 per cent. water-soluble phosphoric acid.
mixed nitrogenous manures : 1 per cent. nitrogen (in a form which must be indicated).
mixed potash manure : 2 per cent. water-soluble potash.

In the case of ammonium-citrate soluble phosphoric acid of mixed or double superphosphates, and also in the case of the undissolved phosphoric acid of bone superphosphate, the guarantee must be at least 2 per cent. For mineral superphosphates only the water-soluble phosphoric acid is guaranteed.

Feeding-stuffs :

(*a*) Genuineness, purity and freedom from adulteration.

(*b*) Good keeping qualities, absence of injurious substances; the normal constitution of the food.

(*c*) In the case of oil-cakes, cake-meals and other concentrated foods, amounts of protein and fat contained ; in the case of molasses the percentage of sugar and the nature of the product ; in the case of dried foods such as potato flakes, the percentage of dried substance; in the case of phosphates of lime to be used as food the percentage of ammonium-citrate-soluble phosphoric acid.

For other feeding-stuffs, and in the case of wagon-loads of the foods mentioned under (*c*), the guarantees shall be fixed by agreement with the buyer. In the case of feeding meals and other starchy foods the vendor may guarantee the percentage of starch.

Other Substances used in Agriculture :

For sulphur, sulphate of copper, sulphate of iron, etc., the guarantee, besides genuineness, purity and normal composition, must refer to the active substance. (See § 4).

Seeds :

1) A minimum percentage of authentic and pure seeds, and the source of the seeds.

2) A minimum percentage of authentic seeds, and a definite germinating capacity.

3) The freedom from dodder (*Cuscuta* spp.) of all leguminous seeds, such as clover, lucerne, birds-foot trefoil, melilot, etc.

4) The freedom from flax dodder (*Cuscuta Epilinum*) of flax and spurrey.

5) The percentage of burnet (*Poterium Sanguisorba*) in sainfoin.

6) By special agreement between the parties, the firms shall guarantee the freedom from other injurious seeds, such as dock (*Rumex*).

7) The guarantee of purity and germinating power to be expressed as percentages of the total weight ; thus the vendor guarantees the number of kgs. of authentic and pure seeds. (purity) present as a minimum in 100 kgs. of the goods, and the minimum of seeds capable of germination in 100 pure seeds (germination capacity).

8) The controlled firm must guarantee all goods sold, even if their exact quality and composition is not known ; in this case the vendor and the purchaser fix beforehand the price of 1 kg. of pure seed capable of germination, and the seed is paid for according to the results of analysis.

9) Also in the case of sale on sample, the purchaser must send to the Control Station a sample of the seed offered and of the actual goods delivered.

In order to establish the identity and genuineness of seeds difficult to identify, such as the different species of *Brassica, Trifolium, Medicago*, the Control Station carries out culture tests, the results of which are considered final. The vendor must give guarantees to this effect. (See § 14).

The practical application of the law is effected by means of "control certificates ".

Control analyses of manures and feeding-stuffs are made gratuitously, according to agreement with the controlled firms, on the following conditions :

(*a*) that it is shown by a certificate of origin that the goods are the product of a controlled firm;

(*b*) in the case of one class of goods the purchase value must be at least 50 frs. (£ 2) except for quantities in excess of 500 kg. (10 cwt).

(*c*) The drawing and despatch of samples must be made according to prescriptions.

The controlled firms must enter in the certificates of gratuitous analysis (on printed forms supplied free by the Central Administration) the following particulars:

(*a*) name and address of the purchaser;

(*b*) name and stamp of the controlled firm, and, if necessary, also the name of its representative;

(*c*) date of despatch of the goods from the firm;

(*d*) exact description and weight of the goods, and the price if the weight does not exceed 500 kg. (10 cwt);

(*e*) number of wagon, in the case of full wagon-loads;

(*f*) the guaranteed percentage of the goods as sent out, and not of the dry substance. (See § 5).

The sampling must be carried out either by the authorities or by the purchaser or his agent, in the presence of the vendor or an impartial witness, in enjoyment of civil rights and acquainted with the provisions of the law. The despatch of the sample should not take place more than three days after the arrival of the goods.

The following instructions are given for obtaining an average sample. In the case of manures and feeding stuffs, samples of at least 2 kg. (4 ½ lbs.) should be taken from the sacks, barrels, boxes, etc. (if possible with a sampling tool). A partial sample must be taken from every tenth sack, barrel, box, etc., or if the consignment comprises less than 50 packages, then from at least every fifth package; if there are less than five packages, each one should be sampled. The samples should be taken from different parts of the mass, and not only from the surface. They should not be taken from sacks whose contents have deteriorated or become damp in transport. If the goods are in a heap, the sample must be taken from in the mass, and not from the surface. These partial samples must be carefully mixed on a clean dry surface and all lumps should be broken up. From this mixed mass three clean and dry wide-mouthed bottles of about ½ kg. (1 lb.) capacity must be filled immediately; they must be corked and sealed with wax or lead; the seal and dies must not be available to the purchaser. In the case of cattle cakes, six must be taken from various places and reduced to pieces of the size of nuts. In the case of dry foods, samples must be packed in clean tin boxes, or in wooden or cardboard boxes. If the consignment comprises several wagons, samples must be taken from each wagon. Lastly, if various parts of the consignment show damage, separate samples should be taken from them. In every case one of the three samples is to be sent to the Station with the free certificate of control, while the other two (reserve samples) are retained by the purchaser.

The samples for analysis should be sent post-free to the Federal Stations of Agricultural Chemistry of Zürich, Berne or Lausanne, according to the district. (See § 6).

With regard to seeds, control analyses are made gratuitously according to the following conditions (see § 15):

(*a*) for every one variety the minimum quantity purchased must be 5 kg. (11 lbs.), except for market-garden crops, for which it is 1 kg. (2 ¼ lbs), and cereals for which it is 25 kg. (55 lbs.);

(*b*) that it is shown by a certificate of origin that the goods are the product of a controlled firm.

(*c*) the drawing and despatch of the sample to be according to the prescription.

The drawing of the samples is carried out in the same manner as for manures and feeding stuffs, except that the mean sample is taken from the whole bulk, carefully mixed, of each variety. When it would be impossible or would take too long to mix the lot, samples should be taken from various parts of each sack and carefully mixed. Samples must be sent in a strong paper bag closed with sealing-wax or lead. The samples are sent post free in minimum quantities as follows: grasses and similar seeds, 50 gms. (nearly 2 oz.); clovers, seeds of conifers, beets and similar seeds, 100 gms. (3 ½ oz.); cereals, sainfoin and other large grains, 250 gms. (9 oz.). For determinations of the weight per unit-volume: samples of oats and bearded grains, 1 ¼ l. (just over 1 quart); of other seeds, ½ l. (nearly 1 pint). Samples are sent post-free to the Seed Control Station at Lausanne or to that at Zürich. (See § 16).

The guarantees are certified by the results of the analyses which are sent free by post to both parties, or by telegram or telephone at the expense of the party requesting it. Both parties can appeal against the results on the grounds of defective analysis, defective sampling, or unevenness of consignment not allowing agreement with the samples analysed although the analysis be correct. Analysis of one of the reserve samples is made by the same Station, and a decisive analysis by the other, the expenses to be paid by the defaulting party. (See §§ 7, 8, 17, 18).

If the analysis shows a defective composition, the purchaser is entitled to return the goods and to repayment of the purchase-money together with costs and compensation. If the percentage composition is below the standard, the controlled firm must refund the difference in value. The following variations in percentage composition are allowed:

For manures:

Water-soluble or total phosphoric acid	0.5 %
Citric-acid or ammonium-citrate soluble phosphoric acid	0.75
Nitrogen in manures containing less than 5 per cent	0.3
Nitrogen in manures containing 5 per cent and more	0.5
Potash	0.5
Fineness of grinding of basic slag	5.0
Calcium sulphate	2.0
Calcium carbonate	2.0

For feeding-stuffs:

Crude protein	2.0
Crude fat	0.5
Sugar in molasses feeds	2.0
Starch	2.0
Presence of earthy matter in cakes and cake meals, except in the case of agreement between the parties	2.0
Presence of lumps in cakes and cake meals, except in the case of agreement between the parties	2.0

When the above variations are exceeded, the compensation must be calculated on the total difference in the percentages guaranteed and the results of analysis, except in certain special cases. (See § 9).

The variation allowed in the case of seeds is fixed at 5 per cent. of the value of utilisation calculated according to the formula $\frac{G \times P}{100}$, where P represents the purity and G the germinating capacity. Special conditions are imposed for the presence of dodder in clover and of burnet in sainfoin. (See § 19).

For analyses of soils, manures, seeds and other products, a special discount of 50 per cent. on the established charges is allowed to Swiss Stations of Agriculture and Forestry, and to agricultural authorities, societies and syndicates, as well as to Swiss farmers requiring analyses for their own use.

Seed selection firms selling their products in Switzerland are partially or totally exempt from the expenses of control, if they submit to the conditions imposed on controlled firms and sell at least 250 kg. (550 lbs.) of cereals or other large seeds and at least 25 kg. (55 lbs.) of seeds of beets, clover, grasses and others. The Experimental Stations have further the right to inspect fields or stations for selection, and to exclude seeds which do not conform to the conditions. (See § 20).

Finally, the Federal Department of Agriculture, responsible for the carrying out of this law, is assisted in this work by the Control Commission of the Federal Stations of Agricultural Experiments and Analyses. It may also summon special congresses of experts for the discussion of questions raised in the carrying out of the law. The constitution of the congress is normally as follows: the members of the Commission of Control; the Central Administration and the chiefs of Federal Stations of Agricultural Experiments and Analyses; the representatives of controlled firms. The particular members of any one conference will be nominated according to the subject under discussion.

The special subjects for discussion will be:

1. Definition of terms, such as purity, genuineness, freedom from adulteration, products of secret composition.
2. Exact description of the goods.
3. Determination of the rules concerning quality, guarantee and control of goods, especially new products.

4. Calculation of compensation for goods below analysis delivered by controlled firms; determination of various points concerning the price of certain active principles.

5. Examination of differences between controlled firms and Federal Stations of Agricultural Experiments and Analyses concerning questions relative to manufacture, to the trade and to the calculation of compensation. (See §§ 24, 25, 26).

1314 – **Reorganization of the Superior Council of Agriculture in France.** — Décret du 15 juillet 1913, portant réorganization du conseil supérieur de l'agriculture. — *Bulletin de la Société des Agriculteurs de France*, Year 1913, No. of Sept. 1, pp. 143-144. Paris, September 1, 1913.

According to the text of the Decree of July 15, 1913, concerning the reorganization of the Superior Council of Agriculture in France, the council in question shall give its advice on all problems proposed by the Ministry of Agriculture and which particularly concern agricultural legislation, measures for the encouragement of agricultural production, questions of agricultural sociology, political economy, duties and import tariffs.

The members of the Council shall consist of three kinds: *ex officio* members, elected members and members nominated by ministerial decree. The *ex officio* members are the presidents of the Agricultural Commissions of the senate, and of the Chamber, the general directors and heads of divisions of the different branches of the ministerial administration. The Academy of Sciences and agricultural associations elect one of their members as a representative to the Council, and the 12 external services connected with the Ministry of Agriculture also each elect one of their officers as a representative. The Minister also nominates 60 members chosen for their distinguished work in pure or applied agricultural science, and 25 members distinguished in the economic and social services. The members are elected or nominated for three years and are indefinitely re-eligible.

The Council assembles at least once a year under the presidence of the Minister of Agriculture, who convenes the assembly.

The Council has the right to elect a Permanent Commission composed of the *ex officio* members and 25 others, of whom 10 are elected by ballot and the rest nominated by the Minister.

1315 – **Law and Regulations rendering Attendance at Local Extension Schools Obligatory in the Provinces of Brandenburg, Pomerania, Saxony, Schleswig-Holstein, Westphalia, in the Rhine Province and in Hohenzollern Territory.** — *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft Domänen und Forsten*, Year 9, No. 10, pp. 303-309. Berlin, October 1913.

The present law of May 19, 1913, confers on the communes of the above-named provinces the right to render by means of communal decree, the attendance at a local extension school during three consecutive winter half-years compulsory on all male persons under 18 years of age and no longer under obligatory attendance at other schools. This right existed already in the provinces of Hesse-Nassau, Hanover and Silesia.

The regulation attached to this law gives details as to the persons subject to this compulsion and as to the curriculum and general plan of instruction of these local extension schools; it contains, in an appendix, the draft of a communal decree regarding these schools.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

1316 - **Position and Conditions of the Prussian Rural Continuation Schools during the Financial Year 1912** (1). — *Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen*, Year 5, Part 1, pp. 1-19. Berlin, October 1913.

In the year 1912 there existed in the kingdom of Prussia 6191 rural continuation schools. Of this number, 265 were instituted by districts (Kreise), 4610 by communes, 32 by Agricultural Associations and 1284 by private persons and other agencies. The expenses entailed by these schools were defrayed in the case of 11 by the districts alone, in that of 20 by the communes alone; by the State alone in 1843 cases, by the State in conjunction with other interested parties in 4263 and by private persons and other agencies in 47. The number of self-supporting schools was seven.

The total cash expenses, not including upkeep, heating and lighting and cleaning the schools, amounted to £ 50 360.

The number of pupils was 98315, that of the teachers 8587. Of the latter, 8137 were elementary school teachers. Of the schools, 6092 were open only in winter, 99 throughout the year.

As compared with the preceding year 1911, the number of these continuation schools has risen in the whole State of Prussia from 5349 to 6191. The total number of pupils rose from 86689 to 98 315. In 1911 the average number of pupils per school was 16.2 and in 1912, 15.9. For next year also a further considerable increase in the numbers of schools and of scholars, especially the latter, is expected in consequence of the law of of May 19, 1913. (2).

1317 - **Practical Schools of Agriculture in Uruguay.** — OTAMENDI, JOSÉ in *Revista del Ministerio de Industrias*, Year 1, No. 2, pp. 57-64 and No. 3, pp. 37-66. Montevideo, June and July 1913.

In this paper the writer makes some suggestions as to the methods to be followed in teaching in the practical schools of agriculture founded at Paysandu, Salto and Cerro Largo by the law of September 1911. His suggestions deal with the general and special trend of the farms attached to the schools, respecting the farming, live stock keeping, wine-making, fruit-growing, market gardening and agricultural industries. He draws up a detailed plan for institution of agricultural experimentation on crops, live stock, agricultural chemistry and so forth, and on the observations to be made on the economic conditions of the agriculture of the country (conditions of land tenure and production, means of transport, colonisation, immigration, and agricultural credit).

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(1) See No. 2, *B* Jan. 1913. (*Ed.*).

(2) See preceding article (No. 1315). (*Ed.*).

1318 - **Local Extension Schools and Agricultural Winter Schools.** — BISCHOFF, KURT in *Das Land*, Year 22, No. 1, pp. 3-6. Berlin, October 1, 1913.

Observations on the aims and tasks, object and manner of teaching, preparation of the teachers of the local extension schools and of the agricultural winter schools, and the relative position of these schools to each other.

AGRICULTURAL SHOWS AND CONGRESSES

1319 - **Agricultural Shows.**

Australia: Queensland.

1914. Feb. 4-6. Stanthorpe. — Agricultural show.

France.

1914. Jan. 30-Feb. 3. Paris. — Fifteenth International Poultry Show, organized by the "Société des Aviculteurs français". Address: 46, rue du Bac, Paris.

Feb. 16-26. Paris, Grand Palais des Champs Elysées. — General agricultural show, including: 1) fat cattle, sheep and pigs; 2) fat poultry; 3) live poultry and rabbits; 4) dairy produce (butter and cheese); 5) agricultural and horticultural produce; 6) wines, ciders, perries and brandy; 7) work dealing with agricultural mutuality; 8) exhibition of materials (packing and poultry). To this show will be annexed an exhibition of instruments, machines and apparatus for mechanical cultivation to be held at the "Esplanade des Invalides", Feb. 16-25. Programmes may be obtained from the Ministry of Agriculture, 78, rue de Varennes, Paris.

May 1- Nov. 1. Lyons. — International Urban Exhibition, with section reserved for silk and silk goods.

June. Paris. — General show of breeding stock: cattle, sheep, pigs and sheep-dogs.

Germany.

1914. May 21-24. Birnbaum (Posen). — Agricultural show.

June 11-17. Stettin. — Great agricultural show; live stock section closes June 14.

June 19-22. Stettin. — Provincial show organized by the Chamber of Agriculture. Will include agricultural and dairy produce and machines and utensils.

June 27-29. Trebnitz (Silesia). — Live stock show. A show of agricultural machines and utensils and of agricultural and horticultural produce will be annexed.

Autumn. Sesslach (Upper Franconia). — Live stock show of the district, and exhibition of agricultural implements.

Paraguay.

1914. May. — The Live Stock Department of the Government, in conjunction with the "Banco Agricolo", is organizing a show and sale of cattle, chiefly with the object of encouraging foreign breeders to introduce choice stock into the Republic.

Russia.

1914. Sept. 6-9 (Aug. 24-27 old style). Mitau (Courland). — Agricultural show organized by the "Kurländische Oekonomische Gesellschaft in Mitau". Will probably be held yearly about this date. Address to: "Geschäftsstelle der Ständigen Ausstellungskommission", Berlin, N. W., Roonstrasse, 1.

Spain.

1914. May. Tortosa. — International agricultural show, and congress of the "Federación Agricola Catalana Balear".

Sweden.

1914. June 15-21. Malmö.— Agricultural Show for Scania, to celebrate the centenary of the foundation of the Agricultural Societies of Malmöhus and Kristianstad. General secretary: G. Leufvén, Malmö.

Switzerland.

1915. Geneva. — Estella Competition (International) for new plants, on the occasion of the 60th anniversary of the foundation of the Geneva Horticultural Society.

United Kingdom.

1914. March 10-12. London. — Spring show of the Hunters Improvement and National Light Horse Breeding Society.

June 4-16. London, Olympia. — International Horse Show. Sec.: Frank F. Euren, 12 Hanover Square, London, W.

June 30-July 4. Shrewsbury. — Show of the Royal Agricultural Society of England.

July 14-17. Hawick (Scotland). — Show of the Highland and Agricultural Society.

United States.

1014. Feb. 10-24. Dallas, Texas. — National Corn Exposition.

1915. San Francisco. — International Live Stock Show (Section of the Panama-Pacific Exhibition). The prizes in the live stock section will amount to $ 175 000, as follows: horses, $ 50 000; cattle, $ 50 000; sheep and goats, $ 25 000; pigs, $ 25 000; poultry, etc., $ 12 500; car-loads of live stock, $ 7 500; dogs and cats, $ 5 000. Additional prizes amounting to $ 100 000 will be given by a number of American societies. The dates are not yet definitely fixed, but the following is the probable arrangement:

	Date of show	Last date for entries
Horses, asses, mules	Oct. 1-12	Sept. 1
Cattle	Oct. 24-25	Sept. 10
Sheep, goats, pigs	Oct. 27-Nov. 4	Sept. 15
Poultry, etc.	Nov. 15-17	Sept. 20
Car-loads of animals	Nov. 8-12	Oct. 1
Cats	Nov. 21-24	

1320 - Agricultural Congresses.

1914. Berne. — International Tuberculosis Conference.

1914. Feb. 17-19. Paris. — Congress of the "Société nationale d'encouragement à l'agriculture".

1914. April 14-17. Paris, Sorbonne. — Fifty-second Annual Congress of the Learned Societies of Paris and the Departments, under the patronage of the Minister of Public Instruction.

1915. Christiania. — International Tuberculosis Conference.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

1321 - The Distribution of Atmospheric Impurities in the Neighbourhood of an Industrial City.

— Crowther, C. and Steuart, D. W. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 391-408. Cambridge, October 1913.

During the twelve months July 1911 to July 1912, samples of rain-water were collected at 14 different points within and surrounding the city of Leeds as a means of estimating the relation between the purity of the atmosphere and the degree of pollution of the rain-water. The stations were so arranged as to give a complete ring of stations on a circle of three miles radius from the centre of the city, whilst to the north, north-east and east additional stations were selected at distances of five miles and seven miles respectively from the centre. Leeds is bordered in all directions except the three above mentioned by a thickly populated industrial area, coal-mining and iron -working prevailing to the south-east and south, and woollen manufacturing to the south-west and west, whilst large engineering works are situated throughout both areas. Little was to be gained therefore by collecting samples more than three miles out in these directions, since the existence of heavy and varied pollution would almost hopelessly complicate the interpretation of results.

The following table summarises the analyses of rain-water.

Collecting station	Rainfall inches	Lbs. per acre. Total suspended matters	Sulphur expressed as SO_3	Chorine	Nitrogen
N. 7*	33.2	72	128	44	6.7
N. 5	33.1	104	192	59	9.1
N. 3.	30.1	175	218	53	5.9
N. E. 7	31.0	126	162	46	6.6
N. E. 5	29.4	150	168	43	9.1
N. E. 3	30.5	120	186	45	8.5
E. 7.	29.1	122	168	43	6.6
E. 5.	28.7	212	171	50	8.0
E, 3.	27.8	200	207	54	7.9
S. E. 3.	25.8	353	357	63	8.9
S. 3	28.2	286	269	47	9.3
S. W. 3.	32.7	239	268	56	8.0
W. 3	30.4	292	284	56	8.7
N. W. 3.	28.3	194	380	70	7.4

* N. 7 = station 7 miles to the north, etc...

The rainfall shows a variation of 20 per cent., and is highest on the hilly side of the city, to the west and to the north.

The total suspended matters and the sulphur in the rain water together form a very good indicator of the degree of air pollution. Considering these substances first: in the above table all stations on the three-mile ring show high figures and the more pronouncedly industrial districts (S. E. 3, etc.) are higher than the districts lying to the north and north-east. Further, there is a sharp falling off in pollution on passing away from the city northwards or north-eastwards but a much more gradual fall in passing eastwards, owing to the influence of the prevailing westerly winds, although there is a certain degree of complication in that this easterly line of stations is situated just on the northern fringe of the coal-mining area; lastly, stations even seven miles out in the cleanest direction show a very polluted atmosphere.

Chlorine, on the other hand, does not appear so reliable a guide as sulphur, and the nitrogen figures are liable to be influenced by external factors, such as leaves, bird droppings, etc.; but they too show the same general tendency to be higher in the industrial districts.

The percentage of tar in the suspended matter, of organic nitrogen in the total nitrogen, and of sulphate in the total sulphur, indicate in a general way that the smoke though greater in quantity is in a higher state of oxidation in the dirtier or more industrial districts, owing to more efficient combustion of the coal.

With regard to the effects of smoke on vegetation, no general effect upon the opening of tree buds could be detected, but throughout the polluted area to the south and to the west a considerable proportion of the leaves of trees were badly damaged before they had been expanded a month, while in the cleaner districts to the north and north-east no appreciable leaf damage could be detected at this period, and, as the season advanced, the damage became accentuated in the polluted areas.

Evidence was also obtained in confirmation of that adduced by earlier observers that the sulphur content of the leaves of trees may afford useful assistance in the diagnosis of smoke-pollution.

1322 – **The Correlation of Rainfall** — Peck, J. and Snow, E. C. in *Quarterly Journal of the Royal Meteorological Society*, Vol. XXXIX, No. 168, pp. 307-316. London, October 1913.

The writers studied the rainfall data (in *British Rainfall*) for 30 stations in the southern and south-eastern part of England during the four years 1908-11 and they drew up series of correlation tables between the rainfall in each month of one year and that in every other month of the same year for each of the four years. Then grouping the correlations into smaller tables, they found that the correlation between winter months was considerably higher, than that between summer months, or between winter and summer months. Or, in other words, though yet far from being able to give accurate predictions for the rainfall in any month, it would appear that while the *relative* rainfall in December can be predicted from a knowledge of the rainfall in two or three of the previous months with a small degree of probability, that of June and July cannot be foretold with the slightest degree of probability.

1323 - **The Movements of Soil Water in an Egyptian Cotton Field.** — BALLS, W. L. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 469-482. Cambridge, October 1913.

On a selected area (20 metres × 10 metres) situated in a field adjoining the Botanical Laboratory at Giza a series of soil samples was drawn every 20 cm. to a depth of 160 cm. during the five months: May 4 to September 21, 1912. The borings were made twice a week and the moisture content of the samples was estimated. A crop of Assili cotton was grown on the area and was planted and cultivated in the conventional manner, yielding an average crop for the land of about 500 lbs. of lint per acre. The size of the sampling area was purposely reduced in order to eliminate irregularities in the subsoil due to a sloping bed of clay, and the plot chosen was made up of the following layers:

Surface to 30 cm. deep	Made soil
30 cm. to 90 cm. »	Stiff clayey soil
90 cm. to 200 cm. »	Loam to sandy loam
Below 200 cm.	Stiff clayey soil

During the experimental period, irrigation water was applied four times to the land, *viz.* May 30, June 23, July 17, August 13.

The results of the analyses are tabulated and set out in the form of curves; taking the mean of the three borings made immediately after an irrigation and the mean of the next, the loss of water from the soil during five sub-periods is estimated as shown in Table I.

As the season advanced the region of maximum loss gradually descended to the deeper layers following the development of the root; then, in the middle of August, things were reversed, the water-table began to rise and masked the root-drying effect. Taking the specifie gravity of the soil as 1, the total loss of water from the soil per day was calculated for each of the five sub-periods; basing his calculations on previous observations of soil evaporation and on all the other evidence at his command, the writer distinguished between the water evaporated directly from the soil and that transpired by the plant, and distributed the total loss as shown in Table II.

The result is only a rough approximation, but the very high figure obtained for the transpiration of cotton indicates that more water is required for the cotton crop alone than is available in the Nile during the summer, and that therefore the plants must draw on the subterranean water supply when it is within reach. It does not follow that the subterranean water, though utilizable, is of any advantage to the crop above. The existence of a water table within 3 metres of the surface still implies a limitation of the root-system, and a risk of submergence, with all its attendant evils.

The writer also concludes from his figures that the effect of the surface irrigation is felt to an indefinite depth in the same way that a rise in the water-table is noticeable well above the level of the latter owing to a general disturbance and redistribution of hydraulic pressure throughout

TABLE I.

Sub-period	Depth in cm.	Water per 100 dry soil							
		20	40	60	80	100	120	140	160
1	*A** May 4-11 . .	18.6	22.6	25.8	31.3	31.4	31.4	30.4	30.4
	B » 22-29 . .	7.7	20.3	25.5	29.4	26.9	29.3	29.4	30.2
	loss	10.9	2.3	0.3	1.9	4.5	2.1	1.0	0.2
2	*A* June 2- 8 . .	22.7	24.2	29.1	30.2	26.9	31.0	31.1	31.2
	B » 16-22 . .	7.2	12.0	25.1	30.1	20.3	29.2	31.3	31.2
	loss	15.5	12.2	4.0	0.1	6.6	1.8	0.0?	0.0
3	*A* June 26 . .	25.3	24.6	27.1	29.3	27.3	29.1	31.7	32.7
	B July 10-17 . .	16.3	16.5	15.5	19.5	25.1	27.6	32.0	33.6
	loss	9.0	8.1	11.6	9.8	2.2	1.5	+ 0.3	+ 0.9
4	*A* July 20-27 . .	25.9	23.4	21.3	24.2	27.8	30.3	31.8	30.4
	B Aug. 3- 7 . .	17.2	15.3	15.7	17.6	17.7	19.2	30.5	29.9
	loss	8.7	8.1	5.6	6.6	10.1	11.1	1.3	0.5
5	*A* Aug. 14-21 . .	27.7	23.6	31.7	19.8	21.2	26.3	30.6	30.7
	B Aug. 31-Sept. 7 .	21.8	20.5	23.6	32.1	27.3	30.7	31.6	31.5
	loss	5.9	3.1	8.1	+ 12.3	+ 6.1	+ 4.4	+ 1.0	+ 0.8

* *A* = borings after irrigation.
B = » before »

TABLE II.

Sub-period	Total loss of water in tons per acre per day	Loss due to	
		soil evaporation	transpiration
1	11	7	4
2	24	10	14
3	25	4	21
4	36	2	34
5	+ 4	—	—

Mean transpiration = 18 tons of water per acre per day.

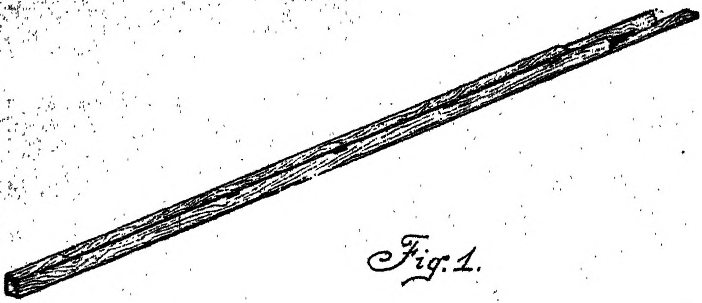


Fig. 1.

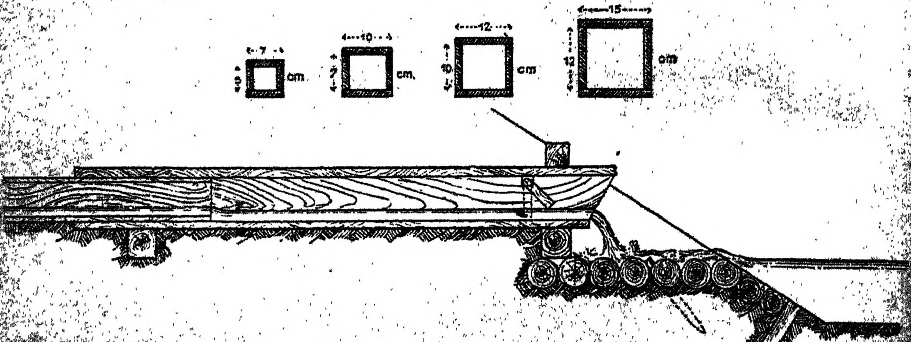

7
5
cm
10
7
cm.
12
10
cm
15
12
cm

Fig. 3.

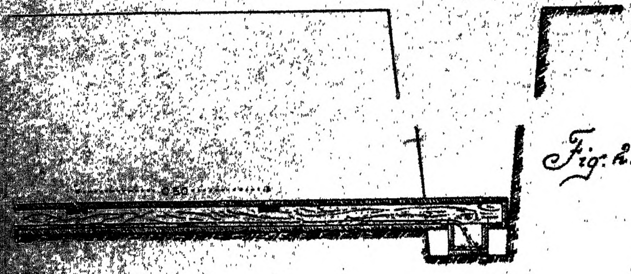


Fig. 2.

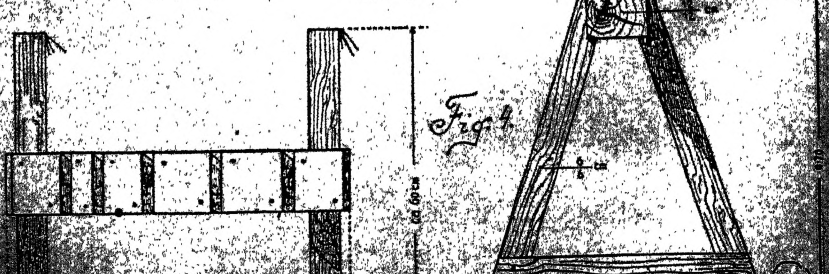
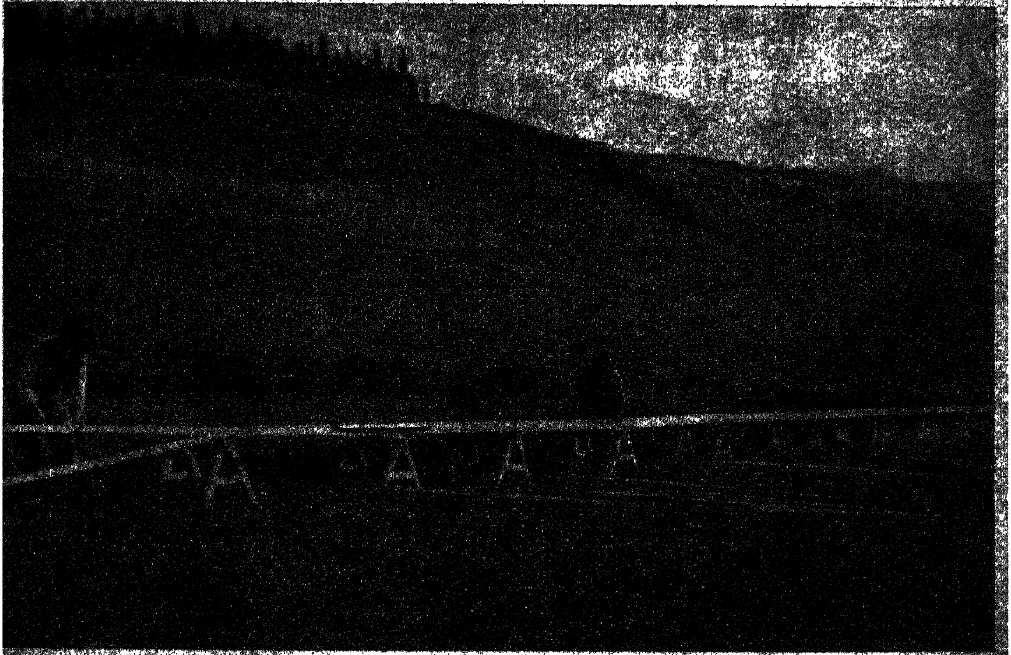

ca. 60 cm
ca. 70 cm
6/6 cm
4/5 cm

Fig. 4.



the system. Further, he points out that unless due regard is paid to the seasonal variation discussed in this paper, determination of soil water content in an Egyptian cotton field by random sampling is almost worthless.

PERMANENT IMPROVEMENTS DRAINAGE AND IRRIGATION

1324 - **Box Drainage** (1). — BUTZ, A. in *Österreichische Moorzeitschrift*, Year 14, No. 9, pp. 134-142. Staab (Bohemia), September 15, 1913.

This new method of draining consists in the use of long wooden drains having a square cross-section. These drains are built of boards, usually 13 feet long, 2 to 8 inches wide, and about $^1/_2$ to 1 inch thick, nailed together and forming a continuous conduit.

In the sides of these drains there are slits through which the subsoil water enters. Several of these drains flow into a common drain of larger dimensions as in other sytems of drainage.

Fig. 1 shows a piece of such a wooden drain as well as the arrangement of the board and side slits, the latter from 20 to 40 inches apart. Below, the cross sections of the minors and mains are shown. (5 cm. = 2 in., 7 cm. = 2 $^3/_4$ in., 10 cm. = 4 in., 12 cm. = 4 $^3/_4$ in., 15 cm. = 6 in.)

Fig. 2 shows the junction of a minor with a main drain situated at a lower level.

Fig. 3 shows the outflow of a main drain into the main ditch.

For making a wooden box drain, three men are sufficient. Five or six gauge trestles are required; these are trestles bearing on the upper bar some wooden blocks fastened at certain intervals corresponding to the gauge of the drains. Fig. 4 gives the plan and cross section of such a trestle.

The writer describes the making and laying down of such a drain, as well as the advantages it presents over other systems of drainage. Its chief merits are the simplicity and reliablemss of the operation of laying, on account of the great flexibility of the box drains, which are besides admirably suited to soft moor soils with very slight fall.

Fig. 5 shows a drain being laid and fig. 6 the extremity of a drain being finished on a row of trestles.

TILLAGE AND METHODS OF CULTIVATION

1325 - **The Effect of Bastard Trenching on the Soil and on Plant Growth.** — PICKERING, S. U. and RUSSELL, E. J. in *The Journal of Agricultural Science*, Vol V, Part 4, pp. 483-496. Cambridge, October 1913.

" Bastard trenching as ordinarily performed consists of two distinct operations; loosening the lower spit of soil, and digging into it farmyard manure or other fertilizing material. A considerable volume of data has been accumulated to show the effect of the addition of farmyard manure to soil, but little is known of the effect of loosening the bottom spit, either on the soil or on the plant.

" The experiments described in this paper were made on plots which had been bastard trenched to a depth of three spits, but not manured. The first and second spits were put back in their natural order. The experiment, therefore, deals simply with deep cultivation effect, and is not complicated by any disturbing factors due to the operation of the manure.

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(1) See No. 229, *B*. March. 1913. (*Ed.*).

" Four distinct types of soil were investigated; a light sand, two loams (both rather heavy) and a strong clay. The bulk of the experiments extended over the four seasons from March 1909 to the end of 1912, a period which included the unusually hot dry summer of 1911, the cold wet summers of 1909 and 1912, and the season 1910 which was of intermediate character.

" Samples of soil were periodically taken for determinations of moisture and nitrate, and observations were made on the growth of fruit trees in the plots.

" The results show that trenching has very little effect on the moisture content of the soils. There is some indication that it facilitates percolation from the surface to the subsoil on heavy loams and clay, but the indication is not very marked, and only comes out with certainty on looking over the whole of the results. It also somewhat increases the subsoil moisture. No other tendency could be distinguished, and we must regard trenching as a very minor factor in determining the water supply to the plant.

" Nor did it appear to lead to any marked increases in the store of nitrate in the soil. There were small gains on the sand and rather larger gains on the clay, which persisted over all the four seasons, but these were never very great, and not much above the error of the experiment. Trenching did not appear to alter the distribution of the nitrate between the surface and the subsoil.

" The behaviour of the plant furnishes a sensitive index to the changes in the soil. Here, however, the indications are not much more definite than those given by the determinations of water and nitrate. An increased leaf size (generally of small dimensions) is shown in three out of the four cases in which this feature was measured, but in the fourth there is a reduction; an increased growth was recorded in three cases, but a reduction in two cases; whilst in the two instances where there were records of crops, both are in favour of leaving the ground untrenched. The effect on the growth of trees appeared to depend largely on the character of the seasons following the trenching and planting, as was exemplified by the different results obtained in the same plot of ground after trenching in 1895, and after retrenching in 1910.

" The practical conclusion may be drawn that bastard trenching by itself done without addition of manure to the bottom spit, is not likely to bring about any sufficient change in the soil to justify the trouble and expense of the operation ".

MANURES AND MANURING

1326 - **The Production of Guano in Chile.** — YUNGE, G. *Estadistica Minera de Chile en 1910 encomendada a la Sociedad Nacional de Mineria por el Supremo Gobierno,* Vol. V, pp. 51-52 and 201. Santiago de Chile, 1913.

The total output of guano in Chile since the beginning of its utilization is shown in the following table.

Output of guano from 1844 to 1909.

Years	Quantity	Value
	Tons	£
1844-1902	161 118	378 117
1903	10 957	20 060
1904	2 625	10 005
1905	31 790	72 676
1906	4 634	14 127
1907	7 399	22 554
1908	857	6 238
1909	10 522	31 879
Total	229 902	555 656
Amount of fiscal surplus price		398 524
Total		954 180

The guano output of the small islands along the coast of Chile and of Pisagua, Punta de Lobos, Magellánes, Chipana, etc., during the last three years was as follows:

	tons	£
1908	857	6 188
1909	10 523	31 879
1910	12 483	45 232

The above quantities are consumed in the country, the exportation of guano being at present prohibited.

The output of 1910 is principally from Punta de Lobos and Chipana.

The approximate composition of these guanos is:

	Nitrogen	Phosphoric acid (P_2O_5)
	per cent.	per cent.
Punta de Lobos	1.45	25.4
Chipana	5.80	16.5
Average	3.62	20.95

Guano is sold for agricultural purposes in bags weighing 100 kg. (gross 102 kg.), or 220 lbs. net., and according to the conditions set by the Government, they are paid the following prices based on the Peso equal to 12 ½ *d*:

Unit of nitrogen (1 kg.)	6 ¼ *d*
» of phosphoric acid P_2O_5	2 ¼ *d*
Dues, etc., per 220 lbs.	3 ⅛ *d*
Percentage of profit	2 ½ per cent.

Calculating the price of the guano on the basis of the average contents and prices given above, it comes to 4.75 pesos per quintal or 3*s* 7 ½ *d* per cwt. (taking the peso at 1*s* 6*d*).

1327 – **Use of Chemical Manures in Cyprus.** — ORR, C. W. (Acting High Commissioner) — *Cyprus Annual Report for* 1912-13, *passim*. London, August 1913.

The Department of Agriculture has taken an active interest in the use of artificials in view of the fact that the soil is especially poor in phosphoric acid. The experiments conducted with various manures succeeded admirably, especially in the case of cereals and pulse, with the result that large quantities of artificials were sold, being used for the first time on a commercial scale.

Demonstrations were also given on the best way of keeping farmyard manure.

1328 – **Sponges as a Fertilizer.** — SMITH, J. G. (Bureau of Soils, Dept. of Agriculture, Washington, D. C.) in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 10. p. 850. Easton, Pa., October 1913.

" Loggerhead " sponge is a large sponge of the gulf of Mexico ; it grows abundantly on the coasts of southern Florida, and appears to be used with wonderful results as a fertilizer, especially by the citrus fruit growers. From analyses made at the United States Department of agriculture it appears that the approximate composition of air-dried material is the following: 4 per cent. nitrogen, 0.75 per cent. each of potash (K_2O) and phosphoric acid (P_2O_5), 5 per cent. of lime (CaO and MgO, mainly the former) and 40 per cent. organic matter. It is probable that other non-commercial species of sponges have a similar composition. If so, and from their demonstrated efficiency as a fertilizer, they deserve to be seriously considered as such wherever they are of easy access.

With a view to determining the feasibility of extending their use, further investigations are in progress.

1329 – **Effect of Certain Artificial Manures on the Bushel Weight of Oats.** — *Department of Agriculture and Technical Instruction for Ireland, Journal.* Year XIII, No. 4, pp. 705-707. Dublin, July 1913.

The main effects of the application of artificials are shown in (*a*) the crop yield and (*b*) the quality of the produce. On the former a great deal of experimental work has been carried out, while the latter has not been exhaustively investigated.

No. of Plot	Manure applied per acre	Average bushel weight
	SERIES I, 1909-11 (35 centres).	
1	No manure	$36\ ^{3}/_{4}$
2	1 cwt. sulphate of ammonia	$37\ ^{3}/_{2}$
3	3 » superphosphate	$37\ ^{1}/_{2}$
4	1 » sulphate of ammonia 3 » superphosphate	$37\ ^{1}/_{2}$
5	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	38
6	5 » of same mixture as applied to Plot 5	$37\ ^{1}/_{2}$*
	SERIES II, 1909-12 (48 centres).	
1	No. manure	37
2	1 cwt. sulphate of ammonia 2 » superphosphate 2 » kainit	$37\ ^{1}/_{2}$
3	1 « sulphate of ammonia 3 » superphosphate 2 » kainit	$37\ ^{1}/_{2}$
4	1 » sulphate of ammonia 4 » superphosphate 2 » kainit	$37\ ^{3}/_{4}$
5	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	$37\ ^{3}/_{4}$
6	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	$37\ ^{3}/_{4}$
	SERIES III, 1910-12 (11 centres).	
1	1 cwt. sulphate of ammonia 3 » superphosphate 3 » kainit.	$37\ ^{1}/_{2}$
2	1 » calcium cyanamide 3 » superphosphate 3 » kainit	37
3	1 ½ cwt. nitrate of lime 3 » superphosphate 3 » kainit	37
4	1 ½ » nitrate of soda 3 » superphosphate 3 » kainit	$36\ ^{1}/_{2}$

* Average for 1910 and 1911 only (26 centres).

In the practical manurial experiments with oats conducted by the Department of Agriculture for Ireland, the grain from the various plots was threshed separately, and it was decided to test the bushel weight of a sample of the produce from each plot.

These tests have been carried out each season for the past four years. The bushel weights were determined by means of a chondrometer or corn balance, the average of two weighings being taken for each sample.

The average results are shown in the following tables:

The results of these tests may be summarized as follows:

I. — In no instance is the difference between the bushel weights of the grain from any two of the plots very great.

II. — In all three series of experiments grain of the highest bushel weight has been obtained from the plots manured with the Department's Stantard Mixture, *viz.*

1 cwt. sulphate of ammonia }
3 » superphosphate } per acre.
3 » kainit }

III. — There was very little difference between the bushel weights of the samples of grain from the plots manured with complete mixtures containing varying quantities of superphosphate and kainit.

IV. — The poorest quality grain was obtained from the umanured plots and that dressed with sulphate of ammonia alone.

V. — Of the four nitrogenous manures, nitrate of soda has produced the lightest grain each season. The results from calcium cyanamide and nitrate of lime were identical.

The results of the field manurial experiments with the oat crop had already shown that the above- mentioned mixtures of artificials produce a profitable increase in yield, and these bushel tests prove that these manural dressings distinctly improve the quality of the grain.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

1330 - **The Substances classed as Nitrogen-free Extract in Feeding-Stuffs and Human Foods.** — KÖNIG, J. in *Zeitschrift für Untersuchung der Nahrungs-und Genussmittel*, Vol. 26, Part 6, pp. 273-281 + fig. Münster i. W, September 15, 1913.

The bodies collectively known in analyses as nitrogen-free extract form a group hitherto not well defined; as carbohydrates and organic acids they are found in all vegetable food stuffs. This group is usually determined not directly but by difference. It is evident that this method of determination is inaccurate in as much as it bears the errors of the determination of the other five components. The name itself of the group is not very felicitous, for it gives an idea of solubility in water, which exists it is true in a small mumber of these bodies such as sugar and dextrine, while many of them that are found in pulse, mushrooms, spices, coffee, tea, etc., have more resemblance, as parts of the cell membranes, to crude fibre than to the soluble carbohydrates.

Nevertheless, of late years, much progress has been made in the knowledge concerning these bodies. As has already been stated, very different organic substances belong to this group. A notable number of them (sugar,

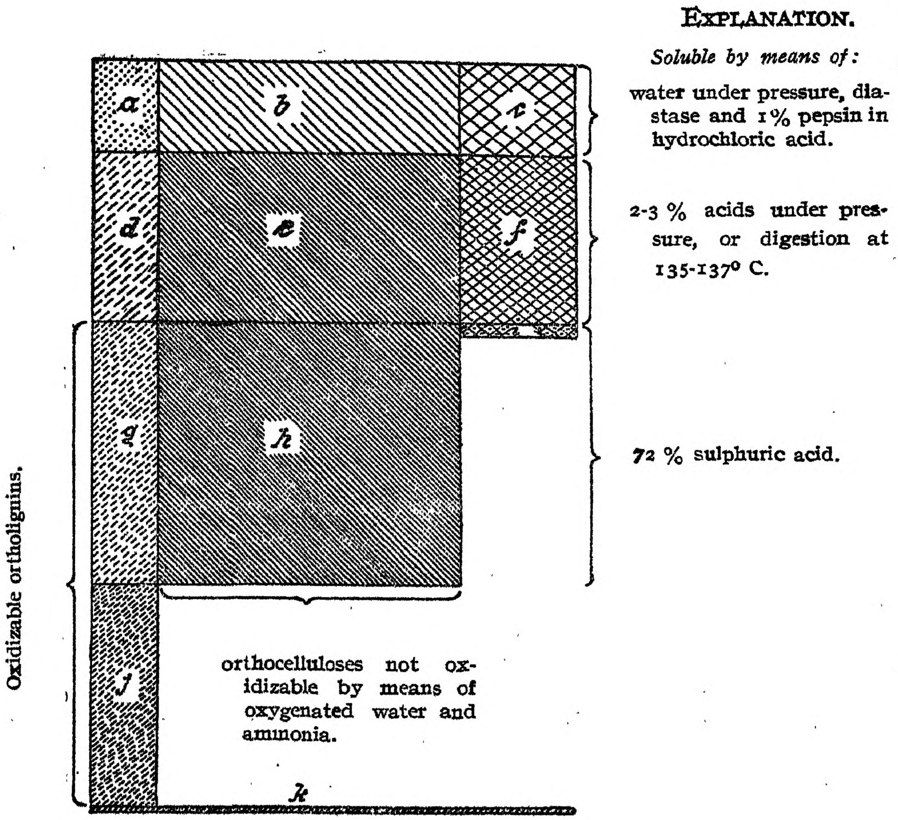
EXPLANATION.
Soluble by means of:
water under pressure, diastase and 1% pepsin in hydrochloric acid.
2-3 % acids under pressure, or digestion at 135-137° C.
72 % sulphuric acid.
Oxidizable ortholignins.
a
b
c
d
e
f
g
h
j
k
orthocelluloses not oxidizable by means of oxygenated water and ammonia.

FIG. 1.

a = protolignins.
b = protocelluloses.
c = protopentosans.
d = hemilignins.
e = hemicelluloses.
f = hemipentosans.
g = ortholignins (uncoloured).
h = orthocelluloses.
i = orthopentosans.
j = ortholignins (coloured).
k = cutin, not hydrolizable or oxidizable.

dextrins, starch and inulin, that is the mono-, di-, tri-, and poly-saccharides, and the organic acids: formic, acetic, butyric, valerianic, oxalic, glycolic, malonic, fumaric, lactic, succinic, malic, tartaric, citric, etc.) are well known and of relatively easy and accurate determination. Still more, in some products, such as cereals, flours, tubers and roots (potatoes, beets) and fruit, the nitrogen-free extract bodies are predominatingly starch (inulin), sugars, dextrin and some organic acids, so that the whole group may be justly considered as " carbohydrates ". Another group which is less known, but in some cases sufficiently so for methods of determination to be recognized, consists of pectic, tannic, bitter, colouring and other substances. Lastly, there remain those bodies which form a more or less abundant residue in foods and fodders rich in cell membranes, which up to 20 or 30 years ago were hardly capable of definition. The discovery of pentoses by Kiliani and Tollens, of hemicelluloses by E. Schulze and the researches of several writers on crude fibre, now allow of a fairly clear idea being formed of this not easily soluble group of extracts, which contribute to form cell membranes.

Among these substances four sub-groups are to be distinguished, namely pentosans, hexosans or cellulose, lignin and cutin, of which the first three are found in various degrees of solubility or condensation in foods and fodders.

The distribution of these substances may be represented as shown by fig. 1.

1. — Substances which, like starch, or dextrins and gums, are already soluble in water at a pressure of two or three atmospheres ; they may be designated by the prefix " proto ".

2. — Substances soluble in dilute mineral acids (about 2 to 3 per cent.) at the pressure of 2 to 3 atmospheres, or at the boiling point of the solvent ; they may be designated like the hemicelluloses by the prefix " hemi " ; to them belong almost all pentosans and among the hexosans the galactans and mannans.

3. — The hexosans and lignins soluble in cold 72 per cent. sulphuric acid or in 1 per cent. hydrochloric acid for 10 hours at 7 atmospheres; and as in this manner the true celluloses can be dissolved, such substances may be designated by the prefix " ortho ".

4. — After the preceding treatment of cell membranes, a brown-black mass of cutin and part of the lignin remains ; on treating with hydrogen peroxide and ammonia the remaining lignin may be oxidized ; this may be called " ortho-lignin (coloured) ", to be distinguished from that which was dissolved by the preceding treatment (No. 2) which is " ortho-lignin (colourless)".

5. — Cutin or cutins, including suberins, are not soluble in 72 per cent. sulphuric acid, in cupro-ammoniacal solution, or in hydrochloric acid solution of zinc chloride, nor are they oxidizable by hydrogen peroxide and ammonia and this in consequence of their waxy nature.

These groups of substances are found more or less together in all vegetable matter, penetrating into or superimposed upon each other and in variable proportions. As in the development of plants pentosans and lignins, and apparently cutins also, compared with the hexosans, increase much more than the celluloses, it is to be supposed that the first product of the cell membrane is constituted by hexosans, on which and in which pentosans and lignins go on depositing ; the latter must be formed from the hexosans or from the pentosans by deposition of metoxylic and acetilic groups. As, when the ortho-celluloses are removed from wood, straw, bran, etc., both lignin and cutin preserve the structure of all membranes, the conclusion to be drawn is that these substances are mixed mechanically and not chemically.

In conclusion, the writer, while pointing out that the transitions among the above groups in their several degrees of solubility are not sharply defined, though the degree of solubility keeps constant, expresses the opinion that for the determination of the individual groups an international method will have to be adopted so as to have at least comparable results.

In an appendix some examples are quoted to show how important it is to throw light on the behaviour of the elements forming the cell membranes in the production of food stuffs.

1331 - **The Enzymes of the Tobacco Plant.** — OOSTHUIZEN, J. DU P. and SHEDD, O. M. (Agricultural Experiment Station, Lexington, Ky.) in *The Journal of the American Chemical Society*, Vol. XXXV, No. 9, pp. 1289-1309. Easton, Pa., September 1913.

Many chemical changes take place in the tobacco plant throughout its growth as well as during the curing and fermentation periods. New chemical substances are formed and other are decomposed. The final result of these reactions gives the colour, texture and aroma to the finished product. A change in these transformations is sufficient to destroy the value of the crop. Several authorities have attributed the curing process to bacterial agencies. If this were so, it would be possible to produce any desired brand of tobacco simply by inoculation. Recently, however, Lœw has shown that these changes are not caused by bacteria but are due to soluble ferments or enzymes, which are produced in the plant during its development; he has shown the presence of diastase, oxidases, peroxidases, proteolytic enzymes and cellulose-dissolving enzymes. According to him, the fermentative changes in the tobacco leaf are caused by two oxydising enzymes which take oxygen from the air and effect the decomposition of the various components of the leaves with the formation of new products. These enzymes are in the nature of proteins, and are present in the protoplasm of the cells. Under favourable conditions they are set free in the leaf tissues and effect the above-mentioned changes. They are easily destroyed by excessive heat or too rapid drying.

The writer has studied these enzymes in two typical tobaccos in Kentucky, *viz.*: the White Burley variety and the dark type Yellow Prior. He made experiments with the seeds, green leaves in different stages of development, cured leaves, and with a sample of soil. The seed and leaves showed in every case the presence of appreciable quantities of invertase, diastase, emulsin and reductase, in many cases inulase and a proteolytic enzyme were also found. Soil, on the other hand, contained no enzymes except in two cases. Oxidases appears to be present in the tobacco leaf at all stages of its growth and gradually increase in amount from the seedling stage until the topping stage, after which they gradually decrease until, in the cured leaf they practically dissappear.

During the curing and fermentation periods there is a great loss in weight, as much as 15 per cent., about ¼ of which is solid matter. Certain gases are developed, amongst which ammonia is easily detected. Practically all the starch disappears during the early part of the process and sugar is formed as a new product. This shows the important part played by diastase. The sugars also disappear, being probably destroyed by oxidases. The presence of invertase leads to the conclusion that cane sugar may be stored in the root and afterwards translocated to the leaves. The protein content of the leaves decreases considerably during the ripening of the plant, also during the curing and fermentation period. The presence of amino-compounds during these processes is further proof of proteolytic enzymes. The nitrates also decrease and the nicotine content diminishes. This suggests the presence of reductase and probably there are enzymes acting on the resins and gums. It is believed that the aroma of tobacco is partly due to the decomposition products of gums and resins, as well as to the breaking up of glucosides. Positive tests have been obtained for a glucoside splitting ferment. The presence of fats and proteins results in tobacco of inferior flavour. They are removed by lipeolytic and proteolytic enzymes, provided the conditions are favourable.

The characteristic brown colour which develops during fermentation is attributed to the action of oxidases During the smoking process it has been shown that an ethereal oil is formed from certain products and this probably contributes to the flavour. Citric, malic and oxalic acids are found in greater quantities in the cured leaf than in the green leaf. These are probably transformed to acetic and butyric acids during fermentation. Thus we see that numerous complex chemical changes take place during the growth, curing and fermentation of tobacco and that enzymes play a very important part in these changes. For the product to obtain the greatest commercial value, extreme care and attention is necessary at the critical stage of maturity and also during the curing and fermentation.

CEREAL AND PULSE CROPS

1332 - **Statistical Study of Wheat Cultivation and Trade, 1881-1910.** — UNSTEAD, J. F. (Paper read before the Royal Geographical Society) in *The Geographical Journal*, Vol. XLII, Nos. 2 and 3, pp. 165-181 and 254-276. London, August and September 1913.

The above paper presents in a convenient form all the available statistics relating to the quantities of wheat produced, imported or exported, and consumed in the various countries, during the thirty years 1881-1910; the direction of certain movements and developments of which the present conditions are but a passing stage are followed and discussed, the whole period being divided up into three ten-year periods, the statistics for each of which are given separately.

The data have been taken as far as possible from the original returns of the various countries, and the rest from periodical returns compiled by one government from those of other countries and from a few other sources. In collating the various sources of information, the writer sifted and weighed the returns and estimates; he indicates the relative value of the final statistics published in the paper by the use of different kinds of type; ordinary type is used for statistics in which the margin of error is thought to be small, *e. g.* those based entirely or almost entirely upon actual official returns whose accuracy has not been challenged; figures in italic type are used for those where there is an appreciable margin of error due either to the incompleteness or uncertainty of the returns or estimates; figures in italic type enclosed in brackets are employed for mere estimates upon which, when they stand alone, definite conclusions can seldom be based; such estimates of the production of single countries are useful mainly in calculating the production of the whole world, for in that case their errors are small in relation to the total amount, and are likely to cancel one another. The same notation has been adhered to in the accompanying table which summarises the principal figures.

In the *United Kingdom* the area under wheat has decreased 37 per cent. during the whole period, while the yield per acre has increased from 28 to 32 bushels, owing partly to the withdrawal of the poorer wheat lands from cultivation and partly to improved seed and methods of cultivation. The imports have risen to supply the requirements of the population, the consumption per head remaining practically stationary. The relative proportion which imports bear to the total consumption has risen from 67 to 80 per cent. and there is every indication that this rise will be maintained in the future. With regard to the sources of the imports, Table I illustrates the changes that have taken place during the period.

TABLE I. — *Percentage of total imports into the United Kindgom from each of the Chief Sources of Supply.*

Period	Russia	Roumania	Austria-Hungary	India	Canada	United States	Australia	Argentina
1881–1890	15	1	3	12	4	51	4	1
1891–1900	12	1	2	7	7	56	2	8
1901–1910	14	1	0	13	12	32	7	16

It is seen that the supplies from the Southern Hemisphere rose from 5 to 10 and then to 23 per cent. of the total imports. This fact is important in so far as it has a steadying influence on the home markets by counteracting in part the effect of bad harvests in the Northern Hemisphere and by bringing corn to the markets at a different season of the year. Figures are also given to show that the percentge of flour in the imports has decreased from 29 to 19 during the last decade, which is probably correlated with the decrease of the supply from the United States.

France too has reduced her wheat area, but has so raised her yield per acre by improved agricultural methods that her total production is now greater than it was before. The country is almost self supporting, and the consumption per head, though slightly decreased, remains one of the highest in Europe.

In *Germany* the wheat area has been small in comparison with that of France and practically constant throughout the whole period, but the yield per acre has risen in the most remarkable manner from 22 to 29 bushels. The increase in the population and the gradual substitution of wheat for rye in the national diet have been met by a large increase in the imports which is not likely to diminish with time.

In *Austria-Hungary*, the wheat area has increased, and this increase took place almost entirely in Hungary, where three-quarters of the wheat area is situated. Austria now absorbs all the surplus grain produced in Hungary and even that does not quite satisfy the demands of the growing population, whose consumption per head is rising at the same time.

The statistics for the *Russian Empire* in the early period are not very reliable, but undoubtedly the acreage, yield and exports have greatly increased both in Europe and in Asia and are liable to further developments. The total production at present is second only to that of the United States, and if the present rate of increase be maintained will occupy the first place in the next decade; but the proportion available for export is likely to decrease with the growth of the population and the rise of the consumption per head.

Norvay and *Sweden* cultivate very little wheat and make small though growing demands on the worlds markets, while *Spain* and *Portugal* are practically self supporting and show no signs of development. *Italy* shows an increase in all the conditions, as does *Roumania*, which is the only country in the Balkan peninsula which supplies reliable figures.

The uncertainty of some of the *Belgian* figures is due to the fact that previous to 1900 the area was only reported decennially and the production of the successive years was given not as an absolute amount, but as the rate of yield upon the area last reported. The country is becoming more and more dependent on foreign supplies, as are also *Holland*, *Switzerland* and *Denmark*. All these countries, with the exception of Switzerland, where data are lacking, show high yields per acre.

In *India* the figures indicate no great changes in the past nor likely ones in the future, but according to the opinions expressed by several authorities when the paper was read, considerable future development may be expected from her as a wheat-producing country.

Japan has increased her area and especially her yield, but is not able to meet her home demands and now imports a quarter of the quantity consumed, and this in spite of the fact that wheat plays but a minor part as a food-stuff in this country. There is no statistical indication of any marked development of the *Chinese* as wheat-eating people.

In the *United Stutes* the official figures collected and issued by the Department of Agriculture have been corrected and made to agree with those of the Census Bureau. Whilst the area and yield have both increased, the exports have decreased, and unless large additional developments occur in the semi-arid region the country will before long require all its produce to satisfy home demands. During the period under consideration the extension of the wheat area occurred entirely in the West Central States, while the increased yield was manifest in all parts, but especially in the older and more settled portions of the country.

Canada shows a remarkable development as a wheat-producing country, the new wheat areas here, as in the United States, are confined to the west central provinces (Alberta, Saskatchewan and Manitoba), where a further considerable area suitable to the crop is still undeveloped (1), so that the country should eventually attain a production equal to that of the United States. The very high consumption per head indicated during the last decade is probably due to the fact that much of the crop is fed to cattle.

The figures for the *Argentine Republic* point to very rapid development which appears likely to be continued.

Algeria has increased her production by raising her yield and has increased her consumption per head and her exports, practically all of which go to France. *Egypt* has greatly increased her yield, but no longer satisfies home demands, while the *Union of South Africa*, though producing very little at present, in view of the climatic conditions and the possibility of applying dry-farming methods to the Veldt, seems likely to extend considerably its wheat cultivation.

The developments in *Australia* are less important than those in Canada and the yields are extremely low, but both area and yield increased in the last decade and allowed a substantial margin of production for export. *New Zealand*, which at no time had a large wheat area, is apparently still further reducing it in favour of pastoral work The yield per acre is high and the consumption per head is remarkably so, the latter being probably party explained by the fact that the production in New Zealand is liable to violent fluctuations: a world shortage in wheat has been reflected by a great outburst of production in New Zealand; following this, when prices have fallen, the produce has been unsaleable and much of it rotted on the ground.

Taking the world as a whole there was an increase of about 300 million bushels (about 14 per cent.) from the first to the second period, but from the second to the third period there was an increase of nearly 700 million bushels (about 25 per cent.). This great increase was due mainly to an increased acreage, but to some extent (about 8 per cent.) to an increased averrage yield per acre, for while in the first two periods this was 12 bushels, in the third period it rose to 13 bushels per acre.

In each period Europe has produced more than half the total crop, North America has come next, and Asia has been third. The other continents have produced a much smaller amount: South America has increased its importance because of Argentina, and Africa and Australia each produce the same small quantity.

The examination already made of the conditions in the separate countries has led to the conclusion that the acreage may be considerably extended, and a comparison of the yields per acre suggests that in many cases a higher return may be expected. Thus, as the United States already has an average yield of 14 bushels per acre, there seems no reason why with improved methods of cultivation and greater care of the soil, at least as high a return

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(1) See No, 1162, *B* Aug. 1912. (*Ed*).

	Area Sown Million acres			Total Production Million bushels (1)		
	1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10
United Kingdom	2.7	2.0	1.7	76	60	55
France	17.2	17.1	16.2	301	305	319
German Empire	4.7	4.9	4.6	104	125	133
Austria-Hungary	9.5	10.9	11.9	161	186	213
Russia-in-Europe	*30.2*	36.2	47.4	*244*	300	461
Scandinavia	*(0.2)*	0.2	0.2	4	5	6
Iberian Peninsula	*(9.7)*	*(9.8)*	*10.0*	*(107)*	*(99)*	131
Italian Peninsula	*(11.3)*	*11.3*	12.2	118	123	163
Balkan Peninsula	*(6.0)*	*(5.8)*	*(6.0)*	*(76)*	*(74)*	*(77)*
Roumania	*(3.4)*	3.7	4.4	*(42)*	52	73
Belgium	*0.6*	*0.5*	*0.4*	18	16	13
Holland	0.2	0.2	0.1	6	5	5
Switzerland	*(0.1)*	*(0.1)*	*(0.1)*	*3*	*4*	*4*
Denmark	*(0.1)*	*(0.1)*	*(0.1)*	4	4	4
Europe	*(95.9)*	*(102.8)*	*115.3*	*(1264)*	*1358*	1657
Russia-in-Asia	*(8.4)*	*10.6*	14.3	*(74)*	*100*	155
India	*26.7*	*25.2*	*26.0*	*259*	*243*	*294*
Japan	1.0	1.1	1.2	13	19	20
Persia	*(2.2)*	*(1.9)*	*(1.6)*	*(22)*	*(19)*	*(16)*
Turkey-in-Asia	*(4.5)*	*(4.5)*	*(3.5)*	*(45)*	*(45)*	*(35)*
Asia	*(42.8)*	*(43.3)*	*46.6*	*(413)*	*(426)*	*520*
Dominion of Canada	2.3	3.1	5.9	38	55	110
United States	*37.1*	*43.1*	*47.4*	*427*	*559*	*657*
Mexico	*(1.2)*	*(1.2)*	*(1.0)*	*(12)*	*12*	*10*
North America	*40.6*	*47.4*	54.3	*477*	*626*	*777*
Argentina	*2.0*	*5.7*	12.0	*24*	*65*	130
Chili	*(0.9)*	*(1.0)*	*1.1*	*(12)*	14	16
Uruguay	*(0.4)*	*0.6*	*0.7*	*(4)*	*6*	*7*
South America	*(3.3)*	*7.3*	*13.8*	*(40)*	*85*	153
Algeria	*(3.1)*	3.2	3.3	*(21)*	24	33
Tunis	*(0.8)*	*1.0*	1.1	*(5)*	*6*	*7*
Egypt	*(1.2)*	*(1.3)*	*1.3*	*(12)*	*(13)*	*(20*
Union of South Africa	*(0.2)*	*(0.3)*	*0.5*	*(2)*	*(2)*	3
Africa	*(5.3)*	*(5.8)*	*6.2*	*(40)*	*45*	*63*
Australia	3.2	4.1	5.7	27	30	56
New Zealand	0.3	0.3	0.2	8	7	7
Australasia	3.5	4.4	5.9	35	37	63
World	*192*	*211*	*242*	*2269*	*2577*	*3233*

(1) 1 bushel = 60 lbs. of grains. — (2) 72 bushels of flour are assumed to be milled from 100 bushels of grain

Yield. Bushels per acre			Net imports or exports, wheat + flour (2) Million bushels			Consumption per head of population. Bushels		
1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10
28	30	32	Im. 144	Im. 177	Im. 209	6.0	5.9	6.0
17	18	20	Im. 39	Im. 36	Im. 10	8.2	8.1	7.8
22	25	29	Im. 18	Im. 41	Im. 70	2.3	2.9	3.1
17	17	18	Ex. 11	Ex. 1	Im. 3	3.5	3.9	4.2
8	8	10	Ex. 87 (3)	Ex. 104	Ex. 142	*(1.5)*	*1.7*	2.4
(22)	24	*27*	Im. 4	Im. 7.2	Im. 11	*1.6*	*1,8*	2.2
(11)	*(10)*	*13*	Im. 9	Im. 10	Im. 12	*(4.5)*	*(4.1)*	*5.3*
(10)	*11*	13	Im. 23	Im. 22	Im. 38	4.3	4.1	5.5
(13)	*(13)*	*(13)*	—	—	Ex. *(2)*	—	—	*(4.6)*
(12)	14	17	Ex. 21	Ex. 27	Ex. 42	*(3.4)*	3.5	3,7
30	*33*	*35*	Im. 21	Im. 34	Im. 46	6.4	7.5	8.1
27	28	33	Im. 11	Im. 15	Im. 20	4.0	4.2	4.5
(29)	*(31)*	*(33)*	Im. 12	Im. 15	Im. 17	*5.2*	*5.9*	5.1
(27)	*(30)*	*(35)*	0	Im. 2	Im. 4	2.0	2.6	3.0
(13)	*(13)*	*(14)*						
(9)	*9*	11	—	—	—	—	—	—
10	*10*	*11*	Ex. 33	Ex. 23	Ex. 27	*0.7*	*0.6*	*0.7*
13	17	*17*	Im. 0	Im. 1	Im. 5	0.3	0.4	*0.5*
(10)	*(10)*	*(10)*	—	—	—	—	—	(1 to *2*)
(10)	*(10)*	*(10)*	—	—	Ex. *(3)* in good years	—	—	*(2)*
(10)	*(10)*	*11*						
16	18	19	Ex. 2	Ex. 13	Ex. 42	7.2	7.3	9.4
12	*13*	*14*	Ex. 116	Ex. 178	Ex. 125	*4.5*	*4.6*	*5.6*
(10)	*(10)*	*(10)*	—	—	Im. *(1)*	—	—	*(1)*
12	*14*	15						
12	*11*	11	Ex. 4	Ex. 37	Ex. 84	*6.0*	*5.4*	*6.5*
(13)	*(14)*	*14*	Ex. 4	Ex. 4	Ex. 2	*(2.8)*	3.2	3.7
(10)	*10*	*10*	Ex. 0	Ex. 2	Ex. 1	*(5)*	*4*	*5*
(12)	*12*	*11*						
(7)	8	10	—	Ex. 2	Ex. 4	—	4.0	4.8
(6)	*6*	6	—	—	Ex. *(1)*	—	—	—
(10)	*(10)*	*(15)*	Im. 0	Im. 1	Im. 6	*(1.3)*	*(1.3)*	*(2.2)*
(8)	*(8)*	*6*	—	—	Im. 8	—	—	*2*
(8)	*(8)*	10						
8	7	10	Ex. 6	Ex. 6	Ex. 28	5.7	5.1	4.9
25	25	31	Ex. 3	Ex. 1	Ex. 1	9.5	8.7	7.1
10	8	11						
12	*12*	*13*						

The export and consumption per head figures apply to the whole Russian Empire.

may not be obtained in European Russia, where the average is but 10 bushels. As the present acreage is the same as that of the United States, the yield would also be the same, namely 650 million bushels, or an increase of 190 million bushels.

1333 - **Comparative Experiments on Wheat Selection in Hungary.** — LEIDENFROST, CH. DE BARS in *Köztelek*, Year 23, No. 79, pp. 2691-2692. Budapest, October 11, 1913.

During 1912-13 the writer has conducted comparative experiments with four élite strains of pedigree Hungarian wheat, obtained from M. Székács' selections at Arpádhalom (1). The experimental field, on a loamy soil, was prepared very carefully and put under the following crops: summer turnips, chervil, spinach and corn salad. The soil was then disked and manured with 8 tons 7 cwt. of farmyard manure and 155 lbs. of superphosphate per acre. The seed was sown on the 12th of October; germination was normal, but the young plants got a check in winter, so that a dressing of 66 lbs. of sulphate of ammonia was given. The earliest to ripen was No. 17 (July 15); then followed No. 16 (July 17), while No. 219 was the last (July 21).

The returns at harvest are indicated in Table I.

TABLE I.

No. of strain	Yield of grain per acre	1st class grain	Increase above unselected wheat
	lbs.	%	lbs.
16	2023	59.4	664
17	2004	75.9	645
219	2524	55.6	1165
226	2598	70.5	1239
Unselected sample	1359	73.5	—

Dr. Kosutány, director of the Royal Hungarian Institute of Chemistry, carried out analyses of which the results are shown in Table II.

Dr. Kosutány remarks that the proportionate increase in the bushel weight of the samples is surprisingly small. This he attributes to the abnormal season, which also accounts for the low protein content. The formation of starch continues much longer during a cold wet season than during a normal dry harvest. Analysis also shows that the samples contain less

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(1) See No. 353, *B*. April 1913. (*Ed.*)

TABLE II.
Chemical and physical analysis of samples of selected wheat.

Strain		No. 226	No. 16	No. 219	No. 17
Weight per bushel	lbs.	61.4	62.3	63.3	62.4
Weight of 1000 grains	gms.	46.5	39.2	40.3	42.0
Volume of 1000 grains	cc.	37.4	28.7	30.0	31.1
Moisture	%	14.94	14.60	14.78	14.97
Ash	»	1.47	1.71	1.42	1.73
Protein (N × 6.25)	»	12.06	10.93	11.06	10.81
Nitrogen	»	1.93	1.75	1.77	1.73
Fat	»	1.87	1.74	1.89	1.93
Crude fibre	»	3.83	3.79	3.24	3.69
Gluten, moist	«	38.95	31.90	42.45	34.30
Gluten, dry	»	11.69	9.80	12.70	10.68
Quality of gluten	»	weak, lacking in cohesion.			

gluten and more moisture (15 per cent.) than is usual in Hungarian wheats (rarely up to 12 per cent.).

These experiments show the value of seed selection in improving the yield of wheat even in unfavourable seasons.

1334 – **Seeds and Flour of *Dolichos multiflorus*.** — *Renseignements de l'Office Colonial*, No. 9, pp. 510-512. Brussels, September 1913.

The velvet bean (*Dolichos multiflorus*, = *Mucuna pruriens*) is cultivated at Eala (Belgian Congo) as green manure. The following analyses show the nutritive value of its seeds.

	Seeds	Flour
Moisture	13.23	18.30
Mineral matter	2.95	0.18
Fats	5.12	0.09
Crude fibre	4.04	0.43
Pentosans	4.71	traces
Total nitrogenous matter	23.70	0.42
Nitrogen-free extract	41.20	80.58
Undetermined	5.05	(by difference)
	100.00	100.00

The seeds have a food value equal to that of peas and lentils and better than that of *D. Lablab* (hyacinth bean).

	Total food values
D. multiflorus	219
D. Lablab	185
Lentils	218

The starch of *D. multiflorus*, produced by primitive methods, is equal to that of potatoes. If manufactured on a commercial basis the waste could be considerably reduced.

FORAGE CROPS, MEADOWS AND PASTURES

1335 - **Sorghum Growing in the Victorian Mallee for Summer and Autumn Sheep Feed.** — *The Pastoral Review*, Vol. 23, Part 7, p. 673. Melbourne, July 15, 1913

This is a communication of the results of an investigation on the profitableness of growing *Sorghum saccharatum* as summer and autumn feed for sheep in the State of Victoria. Two paddocks, together 270 acres in extent, were sown to sorghum during September and October of last year, and fed off with sheep during six months beginning on November 22, after which they were sown to wheat. The flock consisted of an average of 563 head of ewes. In addition to these two sorghum paddocks, two adjoining grass paddocks very bare of pasture, of about 100 acres each, were available for the sheep while the sorghum paddocks were being "rested" during the test. When the sheep were turned out to graze they were in low condition ; at the end of the test they were quite fat.

The results figure out as follows :

	£	s	d
Profit on 563 sheep grazed as above at 5s per head	140	15	0
Deduct cost of sorghum seed, manure and drilling (£40 10s) and grazing value of bare grass land (at most £30)	70	10	0
Leaving net profit on 270 acres of sorghum	£ 70	5	0
say 5s 3d per acre.			

The result may be considered satisfactory, all the more so as the flock might have been by a couple of hundred head more numerous, besides which an average of 10 head horses and cattle were frequently grazing with the sheep.

FIBRE CROPS

1336 - **Report on Irrigation Experiments with Cotton at Richard-Toll (Senegal) (1912-13).** — LEBERT, A. in *Bulletin de l'Association Cotonnière Coloniale*, Year 11, No. 58, pp. 469-486. Paris, September 1913.

The area devoted to cotton experiments was limited by the number of available pumps and extended over 35 acres. The soil when dry was as hard as cement and contained crevices up to 20 inches deep and 1 ½ inches wide. In such a soil it is necessary to sow from 15 to 20 seeds in each hole. When irrigated, the soil looses its consistency, and the plants, loated with capsules, become top- heavy and require earthing up after each irrigation. Towards the end of March irrigation had to cease as the water became salt. Nevertheless the yield was distinctly better than in previous years; 900 lbs. per acre were obtained, representing 300 lbs. of fibre. Had it not been for the brackish water, the writer estimates that the yield would have been, a third greater. All the crop was of the same quality, a fact of considerable importance in determining its commercial value.

Cost of production.

	Cost per acre £	s	d
Ploughing		13	0
Harrowing		1	10
Manuring	1	11	0
Clearing		1	4
Sowing		7	0
Singling, hoeing, topping		15	1
Irrigation: Hand labour		18	10
Irrigation: Petrol and oil		19	3
Irrigation: Canals		2	9
Earthing-up		15	0
Harvesting	1	1	2
Maintenance of animals		17	10
Total	£8	4	1

The cost of production will be reduced as follows:

1) More efficient methods of cultivation.

2) Improvements in the methods of transport and of applying the manures.

3) Reduction in the cost of hand-labour at harvest by increasing the supply.

1337 – **The Kapok Tree in Togo.** — ULBRICH, E. in *Notizblatt des Königl. botanischen Gartems und Museums zu Dahlem bei Steglitz (Berlin) sowie der botanischen Zentralstelle für die deutschen Kolonien,* Vol. VI, No. 52, pp. 39-65 + plates. Leipzig and Berlin, September 8, 1913.

This bulletin gives the results of an inquiry held in Togo at the instigation of the *Botanische Zentralstelle für die Kolonien,* on the production of kapok.

The writer draws a clear distinction between the two varieties of *Ceiba pentandra* (L.) Gärtn.

1. Spiny: Bushy habit of growth; branches in horizontal layers; very pronounced buttresses at base of trunk; leaves dark green, strongly acuminate; fruits dehiscent on the tree; colour of fibres varying from grey to white; seeds round.

2. Spineless: Trees tall and slender; branches almost erect, at 30° to the vertical; buttresses scarcely visible; leaves light green, slightly acuminate; fruits larger, falling before dehiscence; fibre white; seeds slightly pyriform.

According to the writer, the spineless variety is a cultivated form of the other only met with in the neighbourhood of dwellings and requiring propagation by cuttings to keep true to type. It is also the most suitable for cultivation owing to the absence of spines and obstructive buttresses. and to having larger fruits containing a whiter fibre. As the fruits do not open before falling the kapok is not carried away by the wind or soiled by contact with the ground. This variety, however, requires more sun.

Finally the writer gives a list of points which require to be worked out with regard to the forms of *C. pentandra.*

SUGAR CROPS

1338 – The Position of the Cane Sugar Industry during the Last Twenty Years. — PRINSEN GEERLIGS, H. C. in *The International Sugar Journal*, Vol. XV, No. 178, pp. 466-473. London, October 1913.

The abolition of slavery (1834-1886) together with the sugar bounties, begun in 1883 to give a stimulus to the sugar beet industry, placed the cane industry in a very bad position until the Brussels convention changed the state of affairs in 1903. Being thus placed on an equal footing, the sugar cane industry increased its capital and was able to improve its machinery and methods of cultivation. Since the middle of the 18th century, the industry had made little progress, but after 1880 certain colonies, notably Java and Hawaii, began to apply certain improvements which had been effected in the beet industry.

The cane industry received a great stimulus from the Spanish-American War, which resulted in the occupation of Porto-Rico and the Philippines by the United States and the pouring of American capital into Cuba. This, together with the preferential tariff accorded by the United States to these and the Hawaian Islands, caused a great development of their cane industry. The occupation of Formosa by Japan had a similar effect, as did the establishment of protection in South Africa and Australia. The accompanying table illustrates the changes that have taken place.

Previous to the Brussels convention the quantity of protected sugar cane was hardly one-quarter of the total production and since then it has considerably increased, but with the application of the new American tariff it will amount to only about 12 per cent. of the total production.

Sugar cane is largely consumed where it is produced or in its immediate neighbourhood. The British East Indies consume all the local product and also the greater part of the production of Mauritius and one-third of the production of Java. The United States consume the production of Cuba, Porto Rico, and several of the other West Indies besides that of Hawaii. China and Japan consume the produce of Formosa and a portion of that of Java and the Philippines. The sugar produced in China, Cochinchina, Mexico, the South American Republics, Natal, Australia and Egypt is almost entirely consumed locally. Several of these countries also consume a small proportion of foreign sugar. Formerly Great Britain, the United States and Canada all imported large quantities of sugar from different parts of the globe. Now England alone varies the place of origin of her supplies according to the abundance or otherwise of the harvest in the various producing countries.

World's Production of Sugar Cane in thousand tons.

	1900		1912	
	Protected	Unprotected	Protected	Unprotected
British India	—	1 799	—	2 552
Straights Settlements	—	20	—	6
Cochin China	—	50	—	50
China	—	150	—	60
Japan	40	—	40	—
Formosa	—	45	117	—
Philippinees	—	63	175	—
Java	—	744	—	1 331
Spain	35	—	20	—
United States	273	—	168	—
Mexico	—	75	130	—
Cuba	—	283	2 375	—
Porto Rico	—	52	340	—
Other Antilles	—	241	—	268
Central America	25	—	22	—
Colombia	10	—	10	—
Venezuela	5	—	5	—
Demerara	—	85	—	90
Surinam	—	13	—	13
Ecuador	6	—	7	—
Peru	118	—	140	—
Brazil	185	—	204	—
Argentine	117	—	150	—
Egypt	—	99	—	58
Mozambique	—	—	30	—
Natal	16	—	97	—
Mauritius	—	157	—	207
Reunion	—	43	—	40
Australia	113	—	130	—
Hawaii	268	—	480	—
Fiji	—	33	—	60
Total	1 211	3 962	4 640	4 735

OIL CROPS

1339 - **Wood-oil Trees of China and Japan.** - WILSON, E. H. in *Bulletin of the Imperial Institute*, Vol. XI, No. 3, pp. 441-461. London, July-September, 1913.

The increasing demands of Europe and North America for wood-oils from China and Japan has resulted in considerable increases in the price and production. The cultivation of these oil-producing trees *Aleurites* sp.) is recommended to Agricultural Departments for experiment in the warm-temperate rocky regions of the colonies. Their culture requirements are of the simplest, growth is rapid and the trees commence to bear fruit in four or five years after the seed is sown. They fruit freely and are apparently indifferent to the nature of the soil.

Chinese species. — 1. *Aleurites montana* Wils. (or Mu-yu-shu).

This species originated in the South-East of China and is still cultivated there. It requires a subtropical climate and abundant rainfall. The male inflorescence is a many-flowered much branched corymb and the female inflorescence a few flowered raceme borne on the same tree. The fruit is egg-shaped-5 to 6 cm. long, 4 t 4.5 cm. wide, pointed at the summit and flattened at the base, with three longitudinal and many transverse much raised ridges ; the interior part of the fruit (mesocarp) is thick and woody and encloses three compressed broadly obovoid seeds about 3 cm. long by 2.5 cm. broad and warty on the outside. The yield of oil from this tree is small.

2. *Aleurites Fordii* (or Tung-yu-shu).

This is the most important species, producing nine-tenths of the wood-oil of China. It is recommended for experiment in various parts of the British Empire. The seeds soon lose their power of germination, but dried in the sun for 2 or 3 days and packed in barrels or sacks they retain their germinating power for 3 or 4 months. It occurs in all the warm temperate parts of China, but more, specially within the watershed of the Yangtze river. It is essentially a hill-side tree thriving in the most rocky situations and in the poorest of soils where there is a minimum rainfall of 70 cm. (27 in). It will also withstand drought and a few degrees of frost. The flowers appear in April before the leaves unfold and are borne in numerous terminal and axillary few-flowered, cymose corymbs. The central terminal flower of each cyme is female, the others usually male.

The fruit is apple-like, green to dull brown when ripe, 4 to 5 cm. long and broad, pointed at the summit, narrowed to the foot-stalk and perfectly smooth on the outside. It contains 3 to 5, rarely more, broadly obovoid seeds. Both fruit and seeds are poisonous, causing severe vomiting and purging. The fruit ripens in September and October and is gathered before dehiscence, placed in heaps and covered with grass and straw to effect fermentation. The skin soon decays and the seeds are easily removed. In China this tree is only planted where other cultivation is impossible. For cultivation on a commercial scale the writer recommends planting not less than 20 ft. apart each way.

The process of extraction adopted in China consists in first crushing the seeds in a circular trough beneath a heavy stone wheel. The mass is then roasted in a shallow pan, placed in a wooden vat with a wicker bottom and thoroughly steamed over a cauldron of boiling water. With the aid of an iron ring and straw it is made into circular cakes which are arranged edgeways in a large wooden press and the oil is squeezed out of them. The yield is about 40 per cent. by weight of the kernel. Chemical analyses of the kernels gave 58.3 per cent. of oil. The local uses of these oils are numerous. They are the chief paint oils of the country and are largely employed as varnish, as water-proofing material, as ingredients in concrete and in medicine.

Physical Properties of Tung-Oil.

	Chapman	Imperial Institute
Specific gravity	0.942	0.940
Saponification value	194.2	191.8
Iodine value %	170.6	166.7
Refractive index at 20° C	1.5179	—
Viscosity by the Redwood Viscosimeter at 15.5° C in seconds	1850	—

Thus tung-oil is characterised by 1) a specific gravity higher than that of almost any vegetable oil, except castor and tallow-seed oils, 2) a refractive index higher than any known vegetable oil and 3) a high viscosity. Its most characteristic property is the formation of a firm gelatinous mass when heated to a temperature of 250° C. for a short time; this change appears to be due to polymerization and not to the absorption of oxygen. The property of forming a gelatinous mass on heating is the basis of a number of tests. Genuine tung-oil should yield a firm jelly which crumbles readily in the fingers and is not sticky.

Its principal uses in Europe and America are in the preparation of paint 'driers', which are compounds of the fatty acid of the oil with metals like lead and manganese, and are known as " tungate driers ". Processes have also been invented for its use in the manufacture of linoleum, rubber substitutes, waterproof paper, etc., but it is not possible to state to what extent the oil is used for such purposes at the present time.

Japanese species. — Aleurites cordata R. Br.

This species is distinguished by its fruit, which is 2.5 cm. long, wider than long, flattened and often depressed at the summit, slightly tapering to the pedicel, with three slight longitudinal and several irregularly transverse ridges. The oil of this tree has been confused with that of the Chinese species. The specific gravity, iodine value and refractive index are lower than in the Chinese variety, and the Japanese oil will remain liquid under conditions such as suffice to convert the Chinese oil into a hard jelly.

The article is illustrated by five plates and a reference index is appended.

RUBBER, GUM AND RESIN PLANTS

1340 - The Cultivation of Rubber Trees in West Africa (1). *Funtumia elastica.* —

CHEVALIER, A. in *Journal d'agriculture tropicale,* Year 13, Nos. 143 and 145, pp. 136-139 and 197-201. Paris, May and July, 1913:

Funtumia elastica is the only tree indigenous to Africa which yields a good quality of rubber. Although it has been cultivated for nearly 30 years, we still know very little of its biological peculiarities. The writer summarizes the observations he has made amongst the natives. These are of great importance, and the conclusions to be drawn from them will serve as a basis for the constitution of new plantations.

Trees which are allowed to develop surrounded by dense undergrowth have long clean stems and appear more suitable for latex production. On the other hand trees planted in clearings and well-kept plantations develop a thick stunted growth and a short, much-branched trunk. They mature earlier but yield less latex.

The writer reviews the results obtained in the principal colonies where *Funtumia* is cultivated, *viz.* the Gold Coast, S. Nigeria, the Belgian and French Congo. He then gives some interesting details of the plantation at Bokoné (Gaboon). In 1906 some trees were planted 12ft. by 12 ft., and others 10 ft. by 7 ft. In both cases the development of the trees was normal. At the end of 6 years they reached a height of from 30 ft. to 35 ft. with clean trunks from 15ft. to 20 ft in length. The author attributes this fine growth to close planting, as the soil was of quite average fertility.

In one portion of the plantation the branches were destroyed by a fungus disease. With a view to promoting a rapid and straight growth in the new shoots it seemed desirable to allow the natural growth to spring up round the trees, especially that of Musangas, which shoots up very rapidly. The half etiolated shoots of Funtumia grew up with the Musangas, and the latter were not cut down until the new shoot had reached a suitable development.

1341 - The Cultivation of *Manihot Glaziovii* in the Belgian Congo. —

JACQUES, A. in *Bulletin de l'Association des planteurs de Caoutchouc,* Vol. V, No. 9, pp. 223-224. Antwerp, September 1913.

Until recently the culture of Manihot has been neglected in the Belgian Congo. In 1911 only two or three small plantations existed, possessing between them some thousands of trees. The writer gives figures showing results obtained in this region with *Manihot Glaziovii.* A tree six years old planted in good soil yields an average of 2 lbs. of dry rubber per annum. The yield increases rapidly with the age of the trees until it reaches 5 or 6 lbs at the age of 8 or 9 years. With hand labour it is possible to establish and maintain a plantation of 1000 ha. (2470 acres), containing 1 200 000 trees, until the trees come into bearing with a capital of 2 million francs (£80 000).

The present price of Manihot rubber on the Antwerp market is under 9*d* per lb. In the event of a further decrease in the price of rubber, plantations of 3 and 4 years growth could be left without cultivation for several years until the price recovered.

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(1) See No. 637, *B.* June 1913. (*Ed.*).

1342 - **The Influence of Rainfall on the Quality of Tobacco in Sumatra.** — SCHAEFFER, G. in *L'Agronomie Coloniale*, Year 1, N. 3, pp. 65-67. Paris, 30. September 1913.

VARIOUS CROPS

The best quality of tobacco leaves are produced when the plant grows very rapidly; consequently an abundant and readily available water supply at the right moment is an important factor in the production of high-class tobacco. Dry weather in the early stages of plant growth would cause a considerable development of the root system in search of moisture; should this be followed by rains (about a month after planting out) optimum conditions should then obtain for rapid growth. Such favourable conditions prevailed during 1911 at Deli, Sumatra, whilst in 1909 the weather conditions were quite the reverse. The quantity of tobacco harvested at Deli in 1911 was slightly greater than that harvested during 1909, but its quality was considerably better, as shown in the following table:

Years	Rainfall in inches		Price per lb.
	March	April	
1909	5.3	1.8	1s 3*d*
1911	0.2	9.1	2s 2*d*

1343 - **Tea in Russia.** — JUMELLE, H. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 260-262. Paris, September 1913.

Russia consumes over 140 million pounds of tea per annum. Two thirds of the tea imported from China are in the form of compressed blocks, either briquettes or tablets.

Tablets.. — The waste powder in the process of manufacture is sifted, and the fragments of leaves are made into tablets, which are subjected to great pressure for some time, then wrapped in tin-foil and white paper. These constitute the best quality of compressed tea.

Briquettes. — These are made from the siftings, consisting of stems and leaf stalks. These are pressed into blocks and subjected to a current of steam for 3 minutes. To compensate for the loss of aroma during this process, 5 to 50 per cent. of foreign tea is mixed in. These briquettes are made of both black and green tea. In the latter case, a longer exposure to vapour is necessary. They are wrapped up in white paper only.

The tablets weigh approximately ¼ lb., and are packed in wooden lead-lined boxes. The briquettes of black tea contain from ½ lb to 3 lbs., whilst those of green tea are made up in two qualities, the best quality weighing 1 ½ lbs. and the second 3 ¼ lbs. They are packed in bamboo baskets lined with leaves.

Attempts at tea cultivation have been made in Russia since 1848. It is grown in the Caucasus, especially on the south-east side of the Black Sea, where the climate is warm and moist and the soil a fertile red clay. The annual production is about 130 000 lbs. The first picking takes place after four years, and is repeated 3 or 4 times each year. The product does not possess the aroma of well-grown tea, and is used chiefly by the poorer classes, who buy it in the form of briquettes.

1344 - **The Cultivation of Buchu.** — VON WIELLIGH, G. R. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 80-87. Pretoria, July 1913.

The cultivation of buchu has been much neglected in South Africa, and, owing to the wasteful method of rooting up the plants to collect the leaves, it is almost in danger of extermination.

The exports have diminished from 243742 lbs in 1908 to 223021 in 1912 and the price of the exported leaf has risen about 500 per cent. The writer carried out experiments with different varieties and obtained the following results:

Varieties. - 1) *Barosma serratifolia* (Kloof Buchu), sometimes known as "fountain buchu" on account of its preference for a damp soil. It grows to a height of 4 feet but may even reach a height of 10 feet, and is found at altitudes varying from 500 to 1000 feet above sea-level.

2) *Barosma betulina* (Mountain Buchu) is the most valuable species as it contains the greatest number of oil glands in its small, light green leaves. It is more compact and dwarf than the above and grows to a height of 3 or 4 feet. It is found at altitudes between 1000 and 2000 feet and is the most abundant species of buchu.

3. *Barosma crenulata* (Large-leaved Buchu), is little known and is not widely distributed.

The soil most suited to this plant is a well-drained sandy loam. It is propagated either by seeds or cuttings. Transplanting takes place during the autumn (March to May) in well cultivated soil, after a heavy rain, and the plants are placed 5 ft. apart each way.

Cultivation. — This consists of weeding and raking the surface soil between the plants; this must be done very lightly, so as not to damage the roots which run horizontally.

Harvest — The leaves are richest in oil in January and February, but if it is desired to save the seed the crop must be cut later.

Uses. — The leaves are used as a diuretic and stomachic. Badly prepared leaves lose a considerable quantity of their properties, and it is preferable to extract the oil in alcohol or boiling water and market the product in this form. It is often adulterated with *Empleurum serratulum*, which is absolutely worthless.

1345 - **The Importance of the Cultivation and Preparation of Medicinal Plants, particulary in Hungary.** — IRK, KÁROLY (Chemist at the Experimental Station for Medicinal Plants at Kolozsvár) in *Köztelek*, Year 23, No. 74, pp. 2553-2555. Budapest, September 24, 1913.

Of late years, pharmaceutical literature has been paying increasing attention to the question of culture and preparation of medicinal plants.

TABLE I.
Hungarian Trade in Dried Medicinal Plants, 1911.

Country	Imports to Hungary	Exports from Hungary	
	— cwt.	cwt.	£ s
Austria	5 197	17 956	28 512–10
Bosnia-Herzegovina	417	26	40–12
Trieste	18	—	—
Germany	951	18 379	38 379– 5
Switzerland	—	218	434–15
Italy	126	2 474	3 352– 0
France	43	690	1 370–17
Belgium	4	30	56– 5
Netherlands	53	190	360– 0
Great Britain	57	1 290	2 046–18
Denmark	—	14	30– 8
Russia	146	199	378–15
Roumania	—	77	195– 0
Servia	2	53	105–15
Turkey-in-Europe	4	53	135– 0
India	6	—	—
Hong-Kong	2	—	—
China	8	—	—
Egypt	—	22	55– 0
Tunis	6	—	—
United States	45	4 302	10 930– 0

Apart from old data published spasmodically and now out of date, TSCHIRCHET may be considered the initiator of the rational cultivation of medicinal plants in Europe. His work (1) and that of THOMAS (2) are looked upon in

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(1) Ueber den Anbau der Arzneigewächse in Deutschland. - *Archiv. der Pharm.*, 1890, 228, 663, Arzneipflanzen. - *Real-Enzyklopädie der Pharm.*, 2. Aufl., etc.

(2) *Arbeiten des pharmazeutischen Institutes der Universität Berlin.*

TABLE II.

		Plants and dried parts of plants used in medicine	Other plants and dried parts of plants; Saponaria roots	Aniseed and coriander	Caraway seed	Pyrethrum powder	Juniper berries
		cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Imports	1911 . .	7 085	7 122	431	8 366	1 470	31 252
	1912 . .	6 451	5 609	—	—	—	—
Exports	1911 . .	46 098	1 254	1 450	457	277	4 757
	1912 . .	39 874	862	—	—	—	—

Germany as the basis of the study on the subject. Next to Germany, Hungary, under the direction of Dr. PATER (1), Director of the Agricultural Academy of Kolozsvár, takes the second place in relation to the study of this subject. Next come MITLACHER in Austria (Korneuburg), SENFT (2) in Bohemia and Dr. VRGOC in Croatia, following Hungary's example.

In Germany, the University of Berlin has set apart an experimental field for this work at Steglitz-Dahlem. In France the Ministry of Agriculture pays particular attention to the cultivation of medicinal plants and publishes the results of experiments, which are carried out on a modern scientific basis. In Sweden, the experimental garden at Landskroma receives state assistance. In America the matter is under the control of the Bureau of Plant Industry with a special section of the Department of Agriculture at Washington to deal with Drug Plantations. The University of Minnesota has an experimental field of considerable area under the control of the Pharmaceutical Institute. Following the example of the Experimental Station for Medicinal Plants in Hungary, stations at Korneuburg and Prague in Austria have already been started. All these Stations, furnished with chemical, therapeutic and pharmacological laboratories, are intended for research with a view to determining on the one hand a rational cultivation of medicinal plants, and on the other the working-out of special chemical experiments.

The author outlines the conditions of the cultivation and preparation of medicinal plants in Hungary and furnishes statistics on the commercial movement in dry medicinal plants in 1911 (see Table I, p. 1873).

As may be seen from the statistics given, medicinal plants exported from Hungary find markets chiefly in Germany, France and America, countries whose great pharmaceutical factories demand considerable importation.

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(1) *Kiserletügyi Körzlemények.*

(2) *Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich.*

Completing these figures by the commercial value of plants and parts of plants not enumerated above, we obtain the gross amount of Hungary's exports and imports, as shown in Table II.

The exportation of medicinal plants from Hungary is increasing and the quality of the products is also improving. The cultivation of these plants in Hungary on a sound basis and their preparation on a larger scale, when the confidence of other countries has been gained, will consolidate this industry and the industrial branches connected with it.

MARKET GARDENING

1346 - **The Present State of Japanese Horticulture.** — *Communicated by* HIROSHI HARA, *Professor of Horticulture in the Faculty of Agriculture, Imperial University of Tokyo, Japan.*

The development of horticulture in Japan dates from the introduction of Western civilisation. Since 1875 more especially, fruit trees, vegetables, flowers and ornamental trees have been imported from Europe and America. Similar importations have been received from China. These species and their varieties have been improved and their cultivation extended.

Houses in European or in Euro-Japanese style have increased in number, while in the arrangement of trees, etc., in the new gardens it has been found necessary to depart from the traditional arrangement of the Japanese country garden.

For the development of horticulture the Government has established a Horticultural Section of the Agricultural Station, which is under the control of the Minister of Agriculture and Commerce, and every provincial agricultural station includes a study of this subject. Besides this, the two Imperial Universities, controlled by the Minister of Public Instruction, possess Faculties of Agriculture which include courses in horticulture.

The area devoted to the culture of fruit trees has extended considerably in the last ten years, and the yield of horticultural products has increased remarkably to meet the growing demand. The amount of produce exported to foreign countries is not yet very great. Its total value rose in 1910 to the sum of 4 673 699 yen (one yen = 2 *s* approx.). The principal exports are tangerines and oranges (746 184 yen), apples (439 518 yen), onions (471 609 yen), potatoes (417 545 yen), lily bulbs (737 888 yen), other plants and bulbs (248 306 yen), preserved fruits and vegetables (310 328 yen).

The fruit trees and culinary plants most generally cultivated are:

Fruit trees: pear, apple, peach, plum, cherry, Japanese apricot (*Prunus Mume*), persimmon (*Diospyros Kaki*), fig, chestnut, vine, tangerine, orange.

Vegetables: Radish, turnip, carrot, burdock (*Lappa edulis*), sweet potato, potatoes, welsh onion (*Allium fistulosum*), onion, cabbage (*Brassica* sp., *B. chinensis*, etc.), *Cryptoenia canadensis* var. *japonica*, *Aralia cordata*, egg-plant, cucumber, gourd, watermelon, peas, beans, strawberry, etc.

Fruit is generally consumed in a fresh state; cooked fruit is not much appreciated. Certain fruits, such as the persimmon, are eaten either fresh or dried. The small demand for preserved fruits is probably due to the fact that they do not go well with a rice diet.

The trees are cultivated on the following systems :

1) *As bushes:* Apple, pear, plum, cherry, Japanese apricot, persimmon, fig, chestnut, tangerine, orange, etc.
2) *In pots:* Peach, plum, Japanese apricot, persimmon, etc.
3) *Umbrella-shaped:* Vine, pear, etc.
4) *As espaliers:* Vine, etc.

Violent winds are frequent in Japan all through the summer and cause damage to fruit trees. The umbrella-shaped system is the best for resisting these winds, though inconvenient for treating insect and fungoid diseases. It is, however, on the whole the most suitable for the climate and is generally adopted for certain fruit trees, being most conducive to fruitfulness. For many years fruits have been cultivated under glass, especially vines, peaches, melons, etc. The forced culture of vegetables increases from year to year, as also the cultivation of flowers under glass.

Great attention is now being paid to the preparation of dry vegetables and to the preservation and packing of fruit.

The climate of Korea is much drier and sunnier than that of Japan: fruit trees flourish better and produce a better quality of apples, plums, cherries, grapes, etc. The cultivated surface and the produce are increasing annually.

FRUIT-GROWING.

1347 - **European Fruit Trees in Central Madagascar.** — FAUCHÈRE, A. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 257-260. Paris, September 30, 1913.

The central region of Madagascar has a very agreeable climate and when cleared of marshes will be quite suitable for settlement. Consequently attempts have been made to acclimatise European fruit. Unfortunately this process becomes complicated by the fact that the trees commence to ripen their fruit towards the end of the winter season during warm damp weather.

The trees vary somewhat in their degree of adaptation. Peaches and apricots fruit abundantly, but plums have not yet given satisfactory results. The apple is almost as successful as the peach, but the pear and cherry are difficult to acclimatise. Figs are very uncertain in their results, whilst the raspberry is extensively cultivated. Good varieties of oranges and tangerines are yet very rare. Vines flourish in this climate and one variety, the Malagasy vine ("vigne malgache") is almost immune to attacks of mildew and meets with considerable favour. The quince is well adapted to the climate and the chestnut grows vigorously, but its fruits are destroyed by insects. The persimmon produces large fruits in great abundance.

The station at Nanisana is largely responsible for the introduction of fruit trees, and possesses extensive nurseries where large quantities of grafted specimens are produced each year.

Fruit culture is no longer only of local interest, as the gardeners of the centre have begun to send supplies to all the markets in the island.

1348 - **The Composition of Irrigated and Non-irrigated Apples.** — JONES, J. S. and COLVER, C. W., in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 424-428. Cambridge, October 1913.

The writers give the results of analyses of 116 varieties of apples grown with irrigation and of 168 varieties grown without irrigation; the percentage of water, total solids, sugars, acids and crude protein was estimated. The differences between the apples from irrigated and non-irrigated trees are small and variable, and where the desiccated apple is the article of commerce, the writers consider that there can be no basis for market discrimination between the fruit from irrigated and non-irrigated trees.

FORESTRY

1349 - **Three Forest Species of the Annamitic Range.** — DUBARD, M. and EBERHARDT, PH. in *L'Agronomie coloniale*, Year 1, Nos. 2 and 3, pp. 38-41 and 76-81, plates 3. Paris, August and September, 1913.

The writers describe three forest species well distributed throughout this range and of considerable economic importance, but not previously recorded.

I. *Wrightia annamensis* Eber. et Dub. This is a small tree very common in Annam and Tonking, scarcely exceeding 7 to 8 metres in height, with a trunk of maximum diameter of 15 cm. (6 in.) It is found in deep valleys in cool shady situations. It produces a very resistant wood used in making wooden clogs. In structure it resembles boxwood. Considering the ease with which it can be cut and worked, it should be suitable for wood carving.

II. *Symplocos multiflora* Eber. et Dub. This tree has cylindrical branches covered with a reddish bark. The inflorescences are arranged terminally in simple clusters of 40 to 60 cm. in length with separate flowers. The wood is used in Annam as building material.

III. *Symplocos Dung* Eber. et Dub. This tree also has cylindrical branches, at first greenish yellow in colour, later developing a light brown covering of bark. The inflorescences are axillary, consisting of simple few-flowered spikes 6 cm. in length. The wood is used for making plough-shares and harrows.

LIVE STOCK AND BREEDING.

HYGIENE

1350 - **A New Species of *Crotalaria* Dangerous to Cattle in German East Africa** — BAKER, E. G. in *Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin), sowie der botanischer Zentralstelle für die deutschen Kolonien*, Vol. VI, No. 52, p. 66. Berlin, September 8, 1913.

The writer describes a poisonous species of *Crotalaria* as *C. Zimmermanni* n. sp.; it is from German East Africa.

ANATOMY AND PHYSIOLOGY

1351 - **Investigations on the Rate of Resorption of Proteins and their Decomposition Products in the Small Intestine.** — MESSERLI, HERMANN in *Biochemische Zeitschrift*, Vol. 54, Parts 5 and 6, pp. 446-473. Berlin, September 2, 1913.

The results of experiments carried out on an eight months old fox-terrier by means of a Thirn Vella fistula are summarized by the writer as follows:

1. The resorbent power of the mucous membrane of the small intestine diminishes with time and with the course of the experiment. The decrease is caused by a disturbed function of the membrane and can go so far that no more protein is taken up.

2. Of the true proteins that were tested it was proved that the serum of blood was the one best absorbed, gliadin followed next, then casein and lastly haemoglobin. Casein, contrary to what was observed in Friendländer's experiments, was resorbed as quickly as other proteins when the activity of the membrane was normal. The quantity of nitrogen resorbed in 10 minutes averaged 20 milligrams for serum, 16 mgm. for gliadin, 12 mgm. for casein and 8 mgm. for haemoglobin. The rate of resorption of the genuine proteins does not seem to depend upon their degree of concentration.

3. The average quantity of nitrogen resorbed in 10 minutes was 27mgm. for peptone, 27 mgm. for ereptone, and 22 mgm. for hydrolised casein. It is therefore probable that in the intestine not all the protein synthesizes into indifferent blood albumen, but that a considerable quantity of nutritive nitrogen is resorbed as more complex substances, such as albumoses and peptone.

4. Whilst during a first series of experiments it was found that with foods poor in nitrogen and those rich in the same element, the rate of resorption of the proteins and protein decomposition products introduced into the fistula did not differ much, a second series of experiments showed a lower degree of resorption for the former kinds of food than for the latter. The lower resorption in the case of a nitrogen-free food is probably due to a disturbance of the physiological function of the intestinal cells caused by the lack of nitrogen.

5. When all the proteins and even the completely separated decomposition products were no longer resorbed by the mucous membrane of the intestine, it was found that the resorption of grape sugar did not differ from that normally observed. It follows that the splitting up of protein does not lead to a power of resorption like that of grape sugar.

1352 - **Cyanogenesis under Digestive Conditions.** — AULD, S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 409-417. Cambridge, October 1913.

Following on his previous work (1) the writer carried out a number of experiments showing the inhibiting power of cellulose on cyanogenesis from linseed cake by incubating 25 gms. of the cake with various fodders which had been dried and reduced to powder, and also with their aqueous extracts. The action of the extracts was always small and occasionally negative (cyanogenesis was reduced to 90 per cent. of the controls, average of 8 trials) while that of the ground plant was considerable and invariably positive (cyanogenesis was reduced to 71 per cent. of the controls, average of 9 trials); in the case of Helianti, which is a coarse, bulky fodder, not only aqueous extracts were tried, but also ether and alcohol extracts, and in no case was their inhibiting faculty as great as that of the extracted residue. Moreover cellulose was prepared both from filter paper and from cottonwool and proved equally effective, the action being due to the adsorption of the cyanogenetic enzyme by the cellulose. This part of the work is being further developed along other lines.

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(1) AULD, S. J. M. The formation of prussic acid from linseed cake and other feeding stuffs: *Journal of the South-Eastern Agricultural College*, Vol. 20 (1912), p. 289; and *Journal of the Board of Agriculture*, Vol. 19 (1912), p. 416; ID. The hydrolysis of amygdalin by emulsin: *Journal of the Chemical Society*, Vol. 93 (1908), p. 1251.

The effect of acids and alkalis on cyanogenesis was also estimated by incubating 20 gms. of the cake in acid or alkaline solutions of various strengths and for different lengths of time. $\frac{N}{100}$ hydrochloric acid reduced cyanogenesis to 9.7 per cent. of its maximum effect, and even $\frac{N}{500}$ hydrochloric acid produced a slackening in the rate of evolution. The alkali appeared rather less effective than the acid as an inhibitor, but $\frac{N}{100}$ alkali reduced cyanogenesis to 27.5 per cent. of its maximum effect and the writer estimated that $\frac{N}{60}$ alkali (which represents the strength of saliva) would prove completely inhibitive. It is to this alkalinity of the saliva that he attributes the innocuous effects of feeding linseed cake to ruminants, as the food would not be within reach of the inhibiting acid of the true stomach for some hours after feeding.

To trace the extent and orientation of cyanogenesis in the animal body, three Hampshire-down tegs were fed with linseed cake before being slaughtered, and after they were killed the stomachs were removed and the contents washed into large flasks and analysed for hydrocyanic acid. The results were as shown in the table (p. 1880).

In each case the paunch contents were alkaline to litmus and the two intermediate stomach compartments either neutral or faintly alkaline; in every case, also, by far the greater part of the meal was still in the rumen. The table shows that a certain amount of prussic acid generation will usually take place from cyanogenetic feeding-stuffs when eaten by animals; also that the greater part of this formation will take place in the paunch in the case of ruminants, and in the fundus portion of the stomach in other animals. The chief limiting factor would appear to be the alkalinity of the masticated food, assisted secondarily by the cellulose present in the ration, and by many of the other food components.

With regard to the conditions of possible poisoning by cyanogenetic feeding-stuffs, the writer remarks that though the nature and alkalinity of the saliva is known to vary considerably, it is doubtful whether the alkali concentration will ever fall sufficiently low to allow prussic acid to be formed in large enough quantity to produce toxic symptoms; he is more inclined to attribute cases of poisoning to the use of feeding-stuffs which

Sheep	Hydrocyanic acid formed, gms.					Percentage of « available » HCN actually formed
	Rumen	Reticulum	Omasum	Abomasum	Total	
No. 1. Given 1 lb. of crushed linseed cake 2 hours before killing	0.03056	0.00388	0.00142	0.00077	0.03663	20.1
No. 2. Given 1 lb. of crushed linseed cake and a few handfuls of hay 2 hours before killing	0.02357	0.00311	0.00160	0.00065	0.02893	15.9
No. 3. Given 1 lb. of crushed linseed cake ½ an hour before killing	0.00906	traces	—	—	0.00906	4.9

contain free acids or which may undergo acid fermentation in the animal body, such as fresh grass, ensilage, etc., together with the cyanogenetic material. Such acid substances are likely to neutralize the salivary alkalinity and suspend its inhibiting powers. Linseed cake fed with acid foods, or imperfectly made linseed gruel or immature sorghum, would thus become dangerous.

Poisoning from Java beans (*Phaseolus lunatus*) seems to form rather a special case and the circumstances generally are so much against prussic acid formation in the animal body that it appears possible that another and unsuspected poison may be present in the seeds of the varieties of *Phaseolus lunatus*.

The small amount of prussic acid formed when cyanogenetic feeding-stuffs are used may be actually beneficial to the animals, acting as a hormone and stimulating the physiological functions in the digestive tract, and may be the cause of the undisputed superiority of linseed cake for fattening cattle. The point is being further investigated by the writer.

BREEDING

1353 - **A Contribution Towards an Analysis of the Problem of Inbreeding.** — PEARL, R. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 577-614. Lancaster, Pa., October 1913.

The writer presents a method for expressing numerically the degree of inbreeding which exists in a particular case by measuring the proportion which the actual number of the ancestors bears to the maximum number possible in that case. The unit of comparison is called the *Coefficient of Inbreeding*, and is written Z; then if

p_{n+1} = possible number of different individuals in the $_{n+1}$ generation
and q_{n+1} = actual » » » » »

$$Z_n = \frac{100\,(p_{n+1} - q_{n+1})}{p_{n+1}}$$

Z rises from 0 to 100 with the degree of inbreeding, and if the value of Z for successive generations in the ancestral series be plotted to the generation numbers as a base, the curve obtained is termed the *Curve of Inbreeding*.

Working with this formula the writer calculated values for Z in three hypothetical cases:

1) continued brother × sister mating ;
2) continued parent × offspring mating ;
3) continued first cousin mating.

	Ancestral generations included	1)	2)	3)
Z_0	1	0	0	0
Z_1	2	50	25	0
Z_2	3	75	50	25
Z_3	4	87.5	68.7	37.5
Z_4	5	93.7	81.2	43.7
Z_5	6	96.9	89.0	46.9
Z_6	7	98.4	93.7	48.4
Z_7	8	99.2	96.5	49.2
Z_8	9	99.6	98.0	49.6
Z_9	10	99.8	98.9	49.8

The above table shows that whereas in the first case the values for Z rise abruptly for the first few generations and then only relatively little change is made by a continuance of this kind of mating, in the second case the rise is less abrupt, but by the time the tenth generation is reached, the values are practically equal to those for the brother × sister mating. In the third case the maximum value for Z never rises beyond 50.

The writer illustrates his method by reference to two actual pedigrees.

1354 - **Preliminary Note on Some Experiments with a Polymorphic Phasmid.** — FRYER, J. C. F. in *Journal of Genetics*, Vol. III, No. 2, pp. 107-111 Cambridge, September 1913.

Among a large brood of stick insects (*Clitumnus* sp.) reared from the egg by Mr. E. E. Green, Government Entomologist in Ceylon, it was noticed that, though the males were all similar, two distinct types of females were present, *viz.* horned green and hornless yellow, while the males were all hornless and chocolate brown. A female of each type was isolated from the brood and, as the males and females had been left together after reaching maturity, it was assumed that both these females had paired. The descendants were as shown in the table (p. 1882).

It is evident that the characters of the presence and absence of horns are Mendelian, as also are those of colouration, and with respect to both it is noteworthy that no intermediates occurred, so that every individual could be assigned directly to one of the four classes. The connection between the possession of horns and the green colour, suggested by the original brood, evidently does not exist and the two pairs of characters are probably quite

Brood Number	Parentage		Males	Females			
				Green		Yellow	
	Female	Male		Horned	Hornless	Horned	Hornless
1	Horned green	× Unknown . .	13	8	3	10	8
2	Hornless yellow	× » . .	4	—	—	—	2
3	Hornless green of brood 1	× of brood 1 . .	48	—	38	—	42
5*	Horned green »	× » . .	30	3	8	8	11
6	Horned green »	Parthenogenetic	—	12	10	—	—
7	Hornless yellow »	× of brood 1. . . .	Died young. Some females with horns.				
8	Hornless yellow »	× » . .	10	—	—	1	7
9	Horned yellow »	× » . .	46	4	6	18	23
10	Horned yellow »	× » . .	24	4	2	17	1
11	Hornless yellow of brood 2	× of brood 2 . .	47	—	12	—	43

* Brood 4 died young.

independent of each other. Finally, and most important, is the definite evidence in brood No. 6 of the segregation of Mendelian factors in parthenogenetic reproduction. There appear to be no previous records of this phenomenon and consequently confirmation is desirable; at the same time the absence of males and the fact that the segregating character is structural seem to be strongly in favour of the correctness of the result.

Assuming that three pairs of Mendelian characters are involved, *viz.* presence and absence of horns, yellow and green colouration, and maleness and femaleness, the results of each brood are discussed separately. On the whole the experimental numbers do not agree well with those expected on the above hypothesis, but it should be noted that there was a very high mortality during the early stages of the insects' life, which may account for some of the discrepancies.

1355 – **The Inheritance of Coat Colour in Horses.** — ANDERSON, W. S. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 615-624. Lancaster, Pa., October 1913.

Using the tables of Sturtevant, Hurst, Wilson and Harper on the inheritance of coat colour in horses, as well as his own relating to the American Saddle Horse, the writer tabulates anew 12 377 matings involving the colour of 37 131 horses.

Chestnut always behaves as a pure recessive, while grey and roan are dominants. The writer examines carefully the chestnut matings with black, brown and bay, as well as the matings of the three latter colours with one another. There are many difficulties in the way of a simple explanation of the results, chief of which are the methods of registration, which make the line of demarcation between the three colours very uncertain and may account for the discrepancies in the tables. The writer suggests the following series of factors :

Chestnut recessive to all
Black dominant to chestnut but recessive to brown
Brown » » chestnut and black but recessive to bay
Bay » » brown » » » gray
Gray and roan dominant to bay.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1356 – **Live Stock Breeding in Prussia during the Last Twenty-five Years** (1). — HOESCH and HITTCHER in *Verhandlungen des Königlichen Preussischen Landes-Oekonomie-Kollegiums*, pp. 83-117 and 227-241. Berlin, 1913.

The total number of cattle existing in Prussia in the year 1883 was 8 737 641, or 15.4 head per 100 acres of area and 312 per 1000 inhabitants. In the year 1911 the total number amounted to 11 682 234, or 20.5 per 100 acres and 287 per 1000 inhabitants. Between 1883 and 1911 young cattle under the age of two years (including calves) increased by 64 per cent., cattle above two years of age by 19.5 per cent. and cows by 25.5 per cent.

The number of pigs increased in the same period from 5 819 136 to 17 244 855, or from 9.5 to 20.07 per 100 acres and from 210 to 423 per 1000 inhabitants.

In 1883 the number of sheep was 14 752 328, but in 1911 it was only 4 372 489, or 533 per 1000 inhabitants in 1883 and 107 in 1911.

The goats were 1 679 686 in 1883 and 2 235 529 in 1907, or 62 and 58 per 1000 inhabitants respectively.

The amount of meat produced for Prussia from Prussian live stock was 66 lbs. per inhabitant in 1883 and 109.5 lbs. in 1911. In the latter year pork constituted 70.6 lbs., or 64.5 per cent., beef and veal 34.5 lbs., or 31.5 per cent., mutton 2.5 lbs., or 2.24 per cent., horseflesh 1.3 lbs., or 1.2 per cent., and goats' flesh 0.6 lbs., or 0.5 per cent.

The production of meat by Prussian live stock has considerably increased since 1883, but the increase in the number of head of cattle has not kept pace with the increased population. Only the number of pigs increased more rapidly than the population, but the increased production of pork has been accompanied by a diminution of mutton. The writers attribute the greater productiveness of the live stock to the increased average weight of the animals and to their precocity. According to ESSLEN the carcase-weight per head of the cattle slaughtered in Germany rose by 27 per cent. from 1880 to 1905, that of pigs by 5.3 per cent., that of sheep by 17.7 per cent. In 1892 the number of adult cattle slaughtered was 15.8 per cent. of the whole number of the adult stock, while in 1907 it was 19.8 per cent. In 1892, 27.8 per cent.

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(1) For horses, see No. 389, *B.* April 1913. (*Ed.*)

of the cattle under two years of age were slaughtered, and in 1907 35.5 per cent. Of the increased precocity in pigs, evidence is afforded by the fact that while in 1892 77 per cent. of the pigs slaughtered were under one year of age, in 1907 there were 86 per cent. below that age. The number of pigs slaughtered every year in Prussia averages 104 per cent. of the number existing at any one time.

The development of Prussian animal husbandry during the last quarter of a century is clearly shown by statistics on the trade in live stock with the other States of the Empire. While in 1886 Prussia exported 34 498 head of cattle more than she imported, the difference between exports and imports in 1911 rose to 152 196 head; the capacity of exportation has thus increased in 25 years by 117 698 head, or 341 per cent. In pigs, in 1886 the excess of those imported from the other States of the Empire over those exported was 47 189, while in 1911 there was an excess of exportation of 2 049 948 head; the capacity of exportation for pigs thus rose by 2 097 137 head. The exportation of pigs into the other States of the Empire was, in 1911, thirty-seven times greater than the importation of pigs into the Empire. The excess of exportation of cattle in the federated States was, in 1911, by 30 458 head lower than the imports into Germany. The yearly greater production of all kinds of meat in Prussia as compared with that of 1883 is in round numbers 1 170 000 tons, or 141.6 per cent.

Like the production of meat, the production of milk has increased in Prussia during the last 25 years, though to a less degree. The value of the milk produced in Prussia in 1911 amounted to upwards of £ 87 000 000. The number of milch-cows has increased from 5 133 226 in 1883 to 6 441 445 in 1911, and the income from milch-stock has reached that derived from bread cereals. For the whole Empire, the value of milk and milk products was calculated in 1912 to be somewhere about £ 150 000 000. Besides this home production, the imports of milk, butter and cheese amounted in 1911 to about £ 9 400 000. The imports of milk and milk products into the German Empire exceeds by about £ 8 430 000 the exports of the same products and is £ 50 000 more than the imports of meat and live stock.

The progress achieved in Prussia during the last 25 years in live stock breeding is shown also by the build of the animals, as can be seen at the shows of the " Deutsche Landwirtschafts-Gesellschaft " (German Agricultural Society). Many breeds of cattle have become fixed in this time, their shapes have improved and their strains become uniform. Great progress has especially been made in pig breeding by the creation of new breeds, such as the Improved German (" Deutsche Edelschwein "), the Improved Country pig (" Veredelte Landschwein ") and the Hanoverian Black-spotted pig. The progress in goat breeding is such that it has become independent of foreign countries.

In the last quarter of a century breeding associations have been founded and herdbooks started. The success which has attended these departures may be judged from the following table :

Year	Number of Breeders' Associations				Number of performance testing associations	Number of cooperative associations for the sale, etc., of live stock
	cattle	pigs	sheeps	goats		
1888	14	—	4	—	—	—
1913	523	139	6	573	c. 500	c. 200
Increase	509	139	2	573	c. 500	c. 200

Of all the breeders' associations in 1912, 434 were under the control of the "Deutsche Landwirtschafts- Gesellschaft". The Chambers of Agriculture worked in harmony with the special associations for the progress of cattle breeding, a great portion of the State subventions passing through their hands. In the year 1903 the sums paid by all the Prussian Chambers of Agriculture for the promotion of stock breeding amounted to £ 95 658, and in 1910 to £ 155 644. The State subvention amounted in 1888 to £ 13 700 for all branches of stock breeding with the exception of horses, and in 1913, including the additions from the "East and West funds" (1), to £ 86 000 in round numbers.

For the supervision of breeding work and for advising breeders there are at present in Prussia 73 Inspectors of breeding and (without considering clerks and the like) some 200 other agricultural officials who occasionally assist in the work. In the year 1888 no Inspectors or agricultural officials had yet been appointed.

The breeders and officials are educated in nine agricultural colleges, in 18 agricultural middle schools and 229 lower schools. There are, besides, associations like the "Deutsche Landwirtschafts- Gesellschaft", the "Deutsche Gesellschaft für Züchtungs-kunde" (German Live Stock Association) and the "Königliche Preussische Landes- Oekonomie-Kollegium" (Royal Prussian Committee on Agricultural Economy) which offer abundant opportunities for instruction by holding lectures and publishing technical works and leaflets.

Lastly the writers discuss the measures to be adopted for the further progress of stock breeding in Prussia; in agreement with the "Landes-Ökonomie Kollegium" they lay down the following lines:

1. Statistiscal information for practical breeders on the present situation and duties of stock breeding from the point of view of private and public economy and a clear demonstration of the causes of success or insuccess in stock keeping.

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(1) These are two permanent funds for the improvement of the agriculture of the country and from which stock breeding also is assisted. (*Ed.*).

2. Promotion of colonisation in all places where the present distribution of property opposes the extension of stock breeding.

3. The most careful observation of the diminution of live stock which is taking place in many localities, for technical reasons, in connection with the cultivation of sugar beets both on large and on small farms, and furthering of all endeavours in favour of improved breeding, and of the spread of performance test associations.

4. Closer union between the Chambers of Agriculture and small farmers.

5. Inducing the local live stock insurance associations to assist the smallest owners of stock, especially pig-keepers.

6. Promoting a cheaper and a more hygienic way of keeping stock, especially among small farmers, by means of permanent pastures.

HORSES, ASSES AND MULES

1357 - **Feeding Experiments with Dried Beer Yeast for Horses.** — CZADEK, OTTO VON in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich,* Year 16, Part 9, pp. 879-889. Vienna, September 1913.

The experiment was conducted on two horses with the object of ascertaining if yeast can replace oats in the rations, or not. The horses, weighing about 880 lbs. each, were given during the experiment, which was divided into three periods of seven days each, the following daily rations divided into three feeds.

Fodder	Period 1.		Period 2.		Period 3.
	Horse I	Horse II	Horse I	Horse II	Horse II
Hay . . . . lbs.	6.6	6.6	6.6	6.6	6.6
Chaff . . . . »	2.6	2.6	2.6	2.6	2.6
Oats . . . . »	6.6	3.3	3.3	6.6	—
Yeast . . . . »	—	0.66	0.66	—	1.3
Potato-meal . . . . »	—	1.3	1.3	—	2.6

Feeding potato-meal with yeast instead of the half or full ration of oats was carried out simply with the object of replacing the carbohydrates wanting in the yeast. As the digestible protein content of the meal is low, it might be expected that the utilization of the fodder given with it would be rather diminished than increased. Before the commencement of the experiment, and between one period and the other, a preliminary feeding period of four days was introduced. During the experiment the animals did not work; they were, however, taken out every day and exercised at a foot pace.

In order to determine the degree of utilization of the fodder this was always carefully weighed and examined before being given to the horses, whose droppings were also examined daily.

From the results given in tables, it appears that by replacing half of the rations of oats by yeast, all the nutritious elements, with the exception of fat, were better utilized than with the full rations of oats. The substitution of the whole ration of oats by yeast has the consequence that besides fat, crude fibre also was less utilized.

The effect of yeast was better when half the oat ration was substituted than when the whole was replaced. In both cases, however, the utilization quotient stood higher than with the full ration of oats. As to how far yeast is superior to oats for putting on flesh could not be determined, owing to the shortness of the time covered by the experiment. Feeding on yeast caused no change in the droppings. The writer concludes from the experiment that in practice it is possible to replace with success at least a part of the oats by yeast.

1358 – **Mule Breeding in Poitou** (1), **France.** — FOUCHARD, P. and HOUMEAU, A. in *La Vie Agricole et Rurale*, Year 2, No. 33, pp. 188-195. Paris, July 19, 1913.

Mares. — The mares used in Poitou for the breeding of mules are of northern origin and their ancestors were probably imported about three hundred years ago from Holland and Flanders. They are powerfully built heavy animals that have a strong resemblance to mules and are therefore considered specially adapted for the breeding of the latter. Their withers height averages 15 ¼ to 16 ¼ hands; the head is long and thin, the lips overhanging and the ears pointed and long. The neck and chest are flat, the legs powerful but coarse and very hairy. The colour of the coat is various.

For the improvement of the breed, about the year 1860 Flemish stallions were introduced, later Percheron and Boulogne stallions and Breton mares. For the last thirty years a Studbook Association has existed. The improved breed is composed of animals with more powerful necks and chests than those of the unimproved strains. The best mares are mostly found in the moor districts of La Vendée and of the Department of Deux Sèvres.

The mares are served between February and June; the foals are usually weaned at the age of six months. For the production of mules, fillies begin to be used at the age of two years. Fillies of this age, at the chief market, Chaillé-les-Marais, fetch from £24 to £36. Colts somewhat over two years make £32 to £48 and upwards.

Jacks. — The jacks used for the production of mules are commonly called " baudets ". They have powerful heads, long and large ears, small eyes and deeply built bodies, with round cruppers, and coarse legs with small hoofs. The colour should be dark; light coats and black muzzles are avoided. For breeding purposes, jacks with long and curly hair are preferred, as their offspring are credited with putting on flesh better than others.

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(1) See No. 711, *B.* June 1913. (*Ed.*).

The jack is always kept in the stable, and fed on hay straw and some oats. During the service season the rations are increased and some wheaten or rye bread is added to them. The breeding of "baudets" is limited exclusively to private studs in the district of Melle in Poitou. The asses are mated in August and September, immediately after the close of the service season for mares. After weaning, which takes place at the age of nine months, the foals are kept in stables. They begin to breed at the age of 2 ½ years.

The sales of jacks are held at the owners' stables. At the age of nine or ten months the animals are worth £40 to £100, at the age of 2½ years £80 to £160, and at 4 years they are paid £200 to £240. First-class animals have not infrequently fetched £320 to £400. The trade in she-asses is insignificant; they are sold at between £16 and £60.

Mules. — The mule of Poitou is especially suited for heavy work. Its neck is broad and muscular, its back is straight, the chest broad and deep, the loins broad, the croup round, the legs very powerful with broad joints and small cylindrical hoofs. It stands 14 ¼ to 15 ¼ hands high. Its hair is short, rough and generally dark coloured. If the muzzle, the inside of the edge of the ear and the insides of the thighs and fore legs are silver-white, then the black colour of the coat is called "boyard": if these spots fail, the coat is described as "bouchard".

The young mule accompanies its dam in the pasture until it is weaned, usually at the age of seven or eight months. After this it is fed in the stable and when it is two years old it is broken in. Preparatory to being sold abroad at the age of three or four years, the animals are kept in dark stables and fed with good hay, barley, oats and maize. They are sold only at the farms. Recently weaned foals are mostly sold to the Dauphiné, Provence, Charente and the northern part of Vienne. The prices range from £24 to £40. Fattened foals from Poitou at prices of from £36 to £76 are imported by Spain, the province of Languedoc, Algeria, Belgium, Germany and Italy. A certain number of mules are exhibited every year in Paris at the general live stock show. For the improvement of the breeding of mules, the most important step would be better support on the part of the State.

CATTLE

1359 – Comparative Trial of Ostfriesland and Simmental Cows in Hungary. —

UJHELYI, E. in *Oesterreichische Molkerei-Zeitung*, Year 20, No. 14, pp. 215-217; No. 15, pp. 231-233. Vienna, July and August 1913.

A test was made throughout the year 1912 at the Agricultural College at Magyaróvár to determine whether the Ostfriesland or the Simmental was the more suitable milch-cow for Hungary. The Ostfrieslands were 22 four-year-olds, some black and red, others whole red; they were imported from their native country; all but one calved normally. The Simmentals were 33 six-year-olds bred on the farm; twelve of them aborted. All the cows were recently calved when the trial began, and they averaged 340 days in milk. The chief results are shown in the accompanying table.

Breed	Average milk yield	Fat content			Production per 100 food units (*)		Performance of best cow	
		max.	min.	av.	milk	butter	food units consumed	milk produced
	lbs.	%	%	%	lbs.	lbs.		lbs.
Ostfriesland.	8 096	3.51	2.51	3.02	236.5	7.83	3 746	11 273
Simmental	7 590	4.26	3.0	3.6	235	9.46	3 771	13 438

(*) The food unit adopted was 1 kg. (2.2 lbs.) of concentrated food, consisting of a mixture of bran, oilcake and groats.

The writer notes that the yield of the Simmentals was very likely reduced owing to the number which aborted; but he believes the Ostfriesland to be a more economical milk-producer in Hungary, and that it should be adopted on farms which have a plentiful supply of fodder and aim at quantity of milk.

1360 - **Comparative Fattening Experiments on Marsh and Moor Pastures in Germany.** — TACKE, in *Jahrbuch über Neuere Erfahrungen auf dem Gebiete der Weidewirtschaft und des Futterbaues*, Year 1, pp. 17-33. Hanover, 1913.

Experiments have been begun on the fattening of bullocks on a moor pasture and a marsh pasture.

1361 - **The Zigaya Sheep.** — RODICZKY, VON in *Zeitschrift für Schafzucht*, Part 10, pp. 228-233. Hanover, October 1913. SHEEP

The Zigaya sheep, known also under the names of Czigáj, Czigárka, Czik and Berkĕ, is the predominant breed for the production of wool in the south-east of Europe, especially in the Balkan countries; besides being bred for its wool it is also kept for its milk and flesh. The wool of the thorough-bred animals is a pure white, but most of the Zigaya wool in commerce is mixed and generally gray or streaked with black. The best Zigaya wool is suitable for cloths. Some decades ago Zigaya wool was exported in large quantities to Western Europe.

In the Balkans the Zigaya sheep form the flocks of the wandering shepherds, who pay no attention to the breeding of their animals. There are very few pure breeds and a uniform type is rarely to be met with in the flocks. For the improvement of the breed, Merinos, Hampshires, Friesian Milk sheep and even Charmoise Mutton sheep have been introduced, but to a limited extent. The use of Friesian rams led to an increase of the milk yield and an improvement in the quality of the wool, while the Hampshire blood caused a better conformation of the body and greater prolificness, but a deterioration of the fleece. The Merino rams bettered the quality of the wool. Zigaya sheep are often mated with Zackel sheep, which are raised in their neighbourhood, and from which, notwithstanding the data found to the contrary in the literature on the subject, they are easily distinguished. Recently the efforts of breeders in several localities have been turned to a rigorous selection and to the elimination of the Zackel blood. The State in Hungary assists these endeavours by breeding good rams in the stud farms at Fogaras and Kolozstorda, and in the agricultural schools at Algyógy, Szent Imre, Rima and Szombat and selling them to sheep breeders. At Fogaras the constant climination of spotted lambs has already succeeded in producing a perfectly white fleece and destroying the last traces of Zackel blood. At Kolozstorda and in other localities, suitable selection for a short time has resulted in increasing the height at the withers, the girth and the live weight of the breed

The pure-bred Zigaya sheep is well built and its size is intermediate between the large Zackel sheep and the common wool sheep. At Fogaras the live weight of an improved two-year-old ram averages 94 ½ lbs., of ewes in milk 77 to 86 lbs. Old rams may reach 132 to 143 lbs., and old ewes 97 to 110 lbs. The Zigaya sheep have a small clean head with a tapering muzzle. The horns, when present, are ringed and curved in a spiral; if they are not spirally curved, as in the Banata Zigaya, it may be inferred that Zackel blood has been introduced. The rams are almost always horned and the ewes hornless. The face and legs are mostly covered with short stiff black hairs. White legs show, according to the writer, the presence of Merino blood. Often individuals with coffee-brown and rusty legs or black and brown spots on the face occur; the latter seem specially suited for the production of milk and the black-headed animals for meat. The latter are highly esteemed in the meat markets of Vienna and Constantinople.

The milk production, as in the Zackel breed, is about 26 to 44 quarts per annum, averaging 31. It is richer in fat than the Zackel milk, and this shows also in the increase of size of the suckling lambs. At Kolozsmonostor, after standing 48 hours, Zigaya milk gave from 19 to 29 per cent. of cream, while Zackel milk yielded only 15 to 23 per cent. The lactation period varies according to the conditions of the pastures, and lasts, according to observations made at Algyógy and Fogaras, 125 to 135 days. At Algyógy the daily yield of milk was found to be 0.253 quart (= 0.086 lb. of cheese) per head, and at Fogaras 0.295 quart (= 0.130 lb. of cheese).

Lastly the writer states that the Stogosch and Burzan sheep, existing together with the Zigaya sheep and mostly considered as a separate breed, are only a cross between Zigaya and Zurkan sheep.

1362 - **Digestibility Experiments with Sheep. Para Rubber Seed Cake.** — AULD, S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 429-433. Cambridge, October 1913.

The writer undertook a feeding trial with three Kent sheep to determine the digestibility of a cake made from Para rubber seeds, which are at present available in considerable quantities and likely to become more so in the future. The cake was light brown and very friable, and when tested for prussic acid failed to give any reaction, though the seeds themselves yielded 0.048 per cent. Its composition was as follows :

	per cent.
Moisture	9.27
Crude protein	29.84
Crude fibre	3.15
Ether extract	20.11
Nitrogen-free extractive matter	33.08
Ash *	4.55
(*Containing sand.	0.23)

The sheep received 450 gms. of cake per day in addition to a basal ration of 900 gms. of chaffed hay and 450 gms. of linseed cake ; they ate their food readily. The experiment was divided into four periods :

1). 7 days of basal ration without collecting faeces.
2). 8 » » » faeces being collected.
3). 8 » » » + Para cake without collecting faeces.
4). 8 » » » » » faeces being collected.

The coefficients of digestibility for Para cake were as follows.

SHEEP	Ether extract	Crude fibre	Crude protein	Nitrogen-free extract
1	97.4	100 *	97.5	96.7
2	97.1	100 *	91.2	92.7
3	97.3	100 *	84.0	96.7
Average	97.2	100	90.1	95.3

* Containing sand.

The experiments gave results which are fairly concordant. In each case the crude fibre of the Para rubber seed cake shows a digestibility coefficient actually greater than 100 per cent. The reason for this is not very obvious. Possibly the Para cake offered a better medium for bacterial growth, or it may itself contain a cellulose-splitting enzyme. The excess was not, however, very large, and there seems little doubt that practically the whole of the small amount of fibre of the rubber cake was digested.

The figures obtained show the Para cake to be one of the most digestible concentrated foods available. This is no doubt partly due to the small amount of crude fibre present. This and the absence of mucilage, as in linseed cake, means a lack of " binding " material and probably accounts for the extreme friability of the product.

FISH

1363 - **Investigations into the Causes of Furunculosis** (1). — FEHLMANN, W. F. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 7, pp. 384-407. Jena, September 13, 1913.

The writer conducted his experiments, which lasted almost two years, at the Institute for Pathology at the University of Graz. It appears that *Bacterium salmonicida* is nothing else than a motionless strain (with immovable flagella) of bacteria which are normally mobile. The movable and the stationary types are distinguished from each other by the terminal flagella, which in the former are wound like spirilli and in the latter are straight. On applying fish agar with 2.7 per cent. of normal soda solution, the movable type can be transformed into the motionless one. The movable type loses its mobility in the body of a salmonid and causes furuncles like the stationary one. Both forms cause a brown colouring to appear on the nutritive medium, much more rapidly on fish agar than on common, slightly alkaline agar.

In growth and form the mobile type resembles very closely *Bacterium fluorescens*. The writer considers it probable that the several "species" producing furuncles belong to one and the same group of bacteria, which descends from strains of *Bacterium fluorescens liquefaciens* and *non-liquefaciens*. *Bact. salmonicida* can therefore, thanks to its great variability, appear sometimes as a harmless denizen of the water or a saprophyte, at other times as a more or less virulent cause of disease. Unfavourable conditions of life predispose the fish to infection and render the bacterium more virulent, while favourable conditions have the opposite action. The writer believes infection to be caused rather by a wound in the muscles than through the intestines. The paper contains an exhaustive account of the experiments made.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

1364 - **Motor Plough Competition at Galanta in Hungary.** — LINDNER, E. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 76, p. 906. Berlin, September 20, 1913. — THALLMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 84, p. 951. Vienna, October 18, 1913. — MARTINY in *Maschinen-Zeitung*, Year 11, No. 19, pp. 225-232. Berlin, October 1, 1913.

This motor plough competition was organized by the local agricultural association (" *Landes Agrikulturverein* ") under the patronage of the Hungarian Ministry of Agriculture. The technical and practical agricultural test began in the second half of the month of July of this year and should have ended with the public trial on August 9 and 10. Owing, however, to the great number of machines, some were not tried till after August 10. On the whole 26 ploughs were tried.

The Committee published on August 9 and 10 the results of the tests of the machines that had been tried; these results are collected in the accompanying table (pp. 1894-5).

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(1) See No. 1275, *B.* Nov. 1913 *(Ed.)*.

The data given in the table as to time and consumption of fuel, etc., are those obtained from an area 5 hectares (12.35 acres) in extent ploughed to a depth of 8 ¼ inches. The weather from the beginning of the trials until August 10, almost without exception, was favourable and did not cause any appreciable difference in the working of the machines. On August 10 the machines that had not yet been tested were: the 100 H. P. Case tractor, 25 H.P. Harvester, 40 H.P. Twin City, 85 H.P. Big four (six cylinders), 60 H.P. Hart Paar, 60 H.P. Gripp, 60 H. P. Köszegi and a double-engine Schlick-Nicholson outfit.

The results of the trials will be published by the Committee in the form of a book in the Hungarian, English and German languages; applications for the book are to be made to the above-mentioned association.

Name	System	H.P.	Time		Fuel	Specific gravity
			hrs.	min.		
Case	Steam tractor	80	6	3	Coal	—
Case	Benzine tractor	40	10	14	Benzine	720
Caterpillar	»	60	5	54	»	760
Harvester	»	30 to 60	9	31	»	720
Titan (Hung.)	»	90	8	17	»	760
Lanz	Benzine rotary digger	60	10	53	»	720
Twin City	Benzine tractor	25 to 45	8	21	»	720
Fairbanks	»	25	11	9	»	720
Big four (4 cylinders)	»	4 to 85	6	54	»	720
Avery	»	31	14	15	»	720
Wiss	Motor plough	80	9	35	»	720
Fürst Stollberg	Benzine tractor	50	11	22	»	720
Mc Laren	Steam tractor	100	6	13	Coal	—
Mc Laren	»	50	8	3	»	—
Kenna	»	90	8	17	»	—
F. Komnick	Motor plough	90	6	41	Benzine	720
Stock	»	50	9	47	»	720
Stock with reversing motion	»	50	8	48	»	720
Akra	»	80	6	46	Benzol	880
Akra	»	80	6	46	Benzine	760

1365 - **The Motor Plough Competition at Parma, Italy.** — *L'Agricoltura Moderna,* Year XIX, No. 20, p. 237. Milan, October 16-31, 1913.

The international competition of machines for working the soil organized by the Italian Touring Club under the patronage of the Ministry of Agriculture, Industry and Commerce, and held in Parma during the months of July and August of this year, has awakened much interest among the best known machine builders of the world. About thirty power ploughs of the most different systems were exhibited. Prizes were awarded to the benzine and petroleum motor ploughs of the following firms: Pavesi, Tolotti and Co., of Milan; the Stock Motor Plough Ltd., of Berlin; the Compagnie Internationale des Machines Agricoles de France, of Chicago and Paris; Emerson Brantingham Implement Co., of Rockford; Alberto Baroncelli,

Consumption of fuel lbs.	Oil — lbs.	Grease — lbs.	Water — lbs.	Number of workmen required	Cost of cart for implements, coals and water	Total cost per acre in Hungary		Nature of soil
						s	*d*	
2 232	14.3	8.6	15 140	2	10 *s* 0 *d*	3	11	Heavy
253	19.8	0.4	68	2	—	4	8 3/4	Light
201	32.1	2.4	158	2	—	2	10 1/2	»
400	19.4	0.9	1 136	2	—	7	0 3/4	»
477	48.4	0.2	23	2	—	5	7	»
353	6.6	2.2	43	1	—	5	9 ¼	»
316	46.6	0.4	33	2	—	6	1 ½	»
371	5.1	2.2	1 226	2	2 *s* 6 *d*	6	5 ½	»
407	36.1	1.4	76	2	—	7	2 ¼	»
305	34.1	0.7	422	1	—	5	8 ¼	»
216	40.3	—	200	1	—	4	4 ¼	»
392	2.9	0.2	—	2	—	6	5 ½	Heavy
1 374	13.0	—	12 837	2	10 *s* 0 *d*	2	9 ½	»
1 330	18.7	—	8 347	2	10 *s* 0 *d*	3	0	»
1 840	6.2	12.8	10 560	2	10 *s* 0 *d*	3	7	»
239	19.8	2.9	50	2	—	4	4 ½	»
227	47.5	1.1	6	1	—	4	8 ½	»
233	28.6	0.7	20	1	—	4	4	»
258	5.5	0.4	34	1	—	3	4 ½	»
258	5.5	0.4	34	1	—	2	6 3/4	»

of Ravenna; " Otav ", of Grumello; Giovanni Montini, of Orvieto. Besides these, the steam traction ploughs of the following firms were also awarded prizes: John and Henry Mac Laren, of Leeds; Charles Burrell and Son, of Thetford; Marshall Sons & Co. Ltd., of Gainsborough; Clayton and Shuttleworth, of Lincoln; Avery Company, of Peoria, and lastly the ploughing outfits on the cable system of Francesco Casali e Figli, of Suzzara, and Violati Tescari, of Ariano.

In connection with this competition there was also an international and national competition of combustion motors for agricultural purposes, in which a classification of the machines exhibited was made by awards of prizes in money and of medals.

1366 - **Competition of Beetroot Lifting Machines in France** (1). — SAGNIER, H. in *Journal d'Agriculture Pratique*, Year 77, Vol. II, No. 40, pp. 439-442. October 2, 1913.

The trials took place on September 23 and 24, 1913, on a 20-acre field in the neighbourhood of Saint-Quentin (Aisne). The ground was slightly inclined, and in a very favourable condition of moisture. Seven makers (5 French and 2 Belgian) showed about 30 machines.

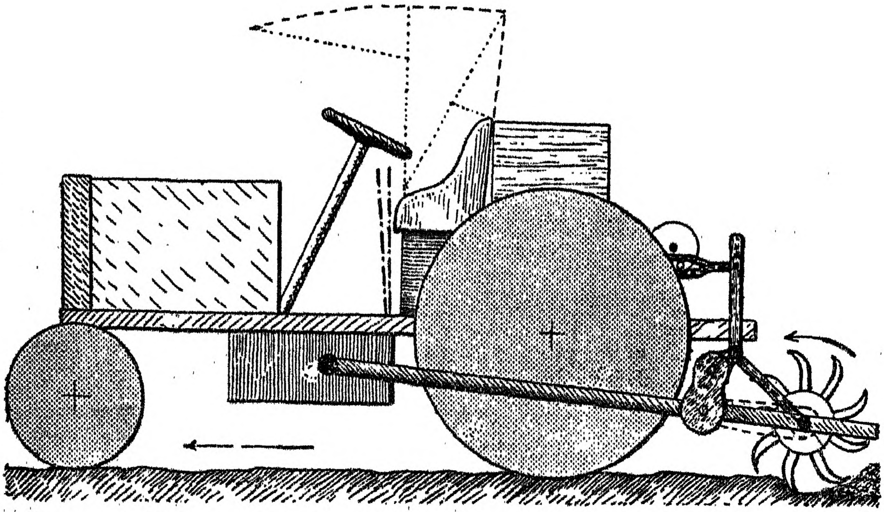
The first class prizes were awarded to:

1. An outfit on the Degrémout system which lifts, tops and cleans three rows of beets at a time.
2. Guichard's one-row machine, which lifts and tops the beets and lays them in small heaps.
3. Laloux and Bridoux' lifter; also a one-row machine which lifts and tops the beets but does not collect them.
4. Another Guichard machine, a three-row one.

The writer gives a detailed description with figures of the Degrémont outfit, consisting of two machines (beet topper and beet lifter) which work in succession. In the Guichard system the beets are topped, pulled out of the ground and laid in heaps by only one machine.

1367 - **Vermont-Quellennec Rotary Digging Machines.** — DE CONDÉ, F. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. 120, No. 2, pp. 369-371. Paris, August-September-October 1913.

The writer gives a detailed description of the machine shown in the accompanying illustration and of its working.



Vermont-Quellennec Rotary Digger.

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(1) See No. 970, *B.* Aug. 1913. *(Ed.)*.

The motor is of 40 H. P. It can travel at four different speeds, namely 3 ½, 2 ¼, 1 ½ and 1 miles per hour. Its weight is 5.4 tons. According to the data furnished by the Commission of the "Automobile Club of France" it gave the following results at the trials conducted at Bourges:

	First day	Second day
Breadth of land tilled	67 in.	67 in.
Average depth of work	5.22 »	6.38 »
Speed per second	15.35 »	—
Area tilled	1.88 acres	0.72 acre
Time required per acre	2 h. 46 min.	—
Consumption of fuel per acre	7.20 gals.	—
Volume of earth loosened for one gallon of fuel.	2616 cub. ft.	—

This machine is built also in another size which is driven by a 60 H.P. motor and tills a strip 71 inches wide.

1368 – **Hand Drill with Revolving Tube.** (German Imperial Patent 264570). — *Maschinen-Zeitung*, Year 11, No. 21, pp. 256-257. Berlin, November 1, 1913.

This portable drill is of simple construction; it is easy to work and it effects a considerable saving of seed.

It consists in the main of a seed hopper, provided with a belt for the convenience of carrying and whose funnel-shaped outlet issues into a horizontal zigzag-shaped revolving pipe, which ends in an immovable chamber leading to an elastic tube. The further extremity of this tube is fitted with a nozzle attached to a rod, by means of which the nozzle may be directed where required.

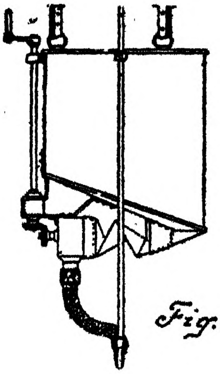


Fig. 1.

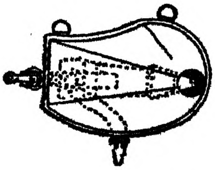


Fig. 2

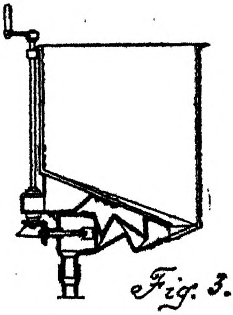


Fig. 3.

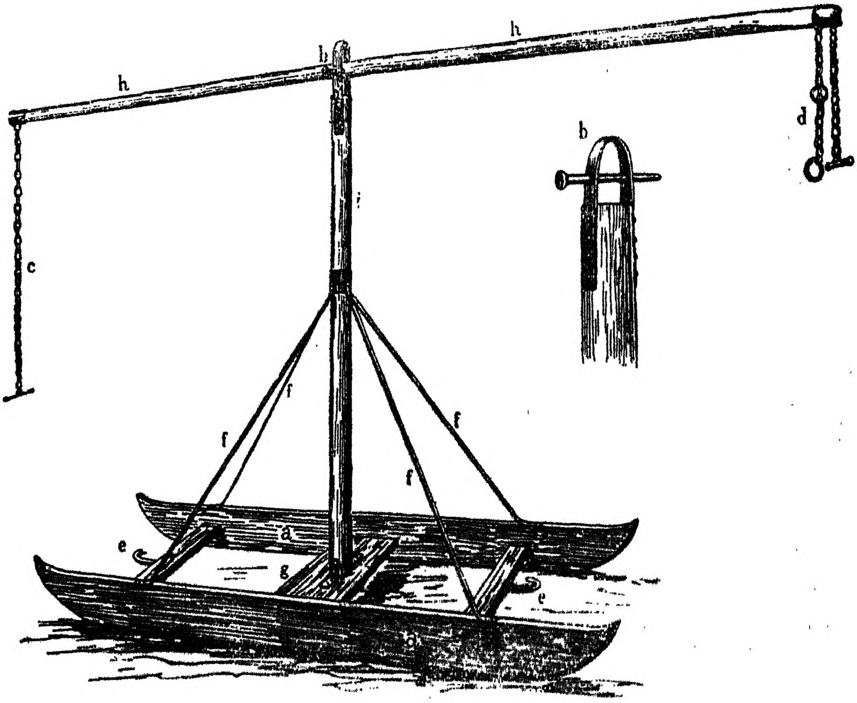
The zigzag pipe is made to revolve by means of a hand crank and toothed gear, and according to the speed at which it is turned, more or less seed is sent into the elastic tube.

Fig. 1. shows a side view, Fig. 2 the plan and Fig. 3 the vertical section of the hand drill.

1369 - **Apparatus for Lifting Straw for Thatching Stacks.** — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 74, p. 882. Berlin, September 13, 1913.

With the apparatus shown in the acompanying figure, the work of lifting straw for thatching is much facilitated.

The working of the apparatus is very simple: when the pressed straw has been taken up by the chain (*d*), a man pulls the chain (*c*) and thus raises the straw to the top of the stack, where a man receives it, frees it from the chains and spreads it on the stack. On releasing the chain (*c*), the lever arm sinks again by its own weight to its former position.



1370 - **Trial of a Barley Drying Plant.** — Hoffmann, F. in *Wochenschrift für Brauerei*, Year 30, No. 36, pp. 484-488. Berlin, September 6, 1913.

The dryer shown in the accompanying figures consists essentially of a hopper, the bottom of which is formed by two frames inclined at an angle of 40° to the horizontal. Where they meet they form an adjustable slit which gives admission to an endless screw situated below it.

The cereal is conveyed on both sides through sliding openings. On both sides there are three rows of slides. When the lowest slides are opened, the frames get charged with grain to a depth of 16 inches. When

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(1) See No. 1074 *B*, Sept. 1913. (*Ed.*).

this layer is heated to 104° F. (40° C.) the next row of slides above it is opened and a layer of moister grain 8 inches deep is formed over the first and already drier layer. When this also reaches 104°, the third row is opened and another layer of barley 8 inches deep is admitted. After about an hour this also has reached the desired temperature; the barley is cooled, let out below and conveyed by the endless screw to an elevator. The driving power is supplied by an electromotor.

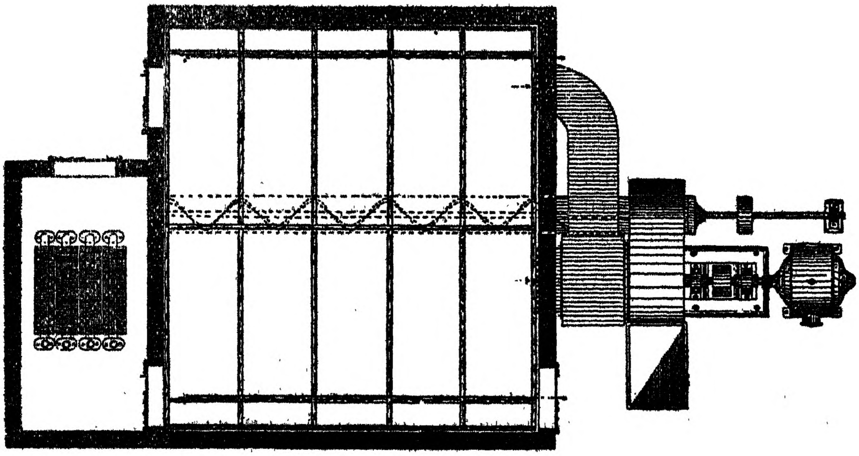

Fig. 1. — Plan.

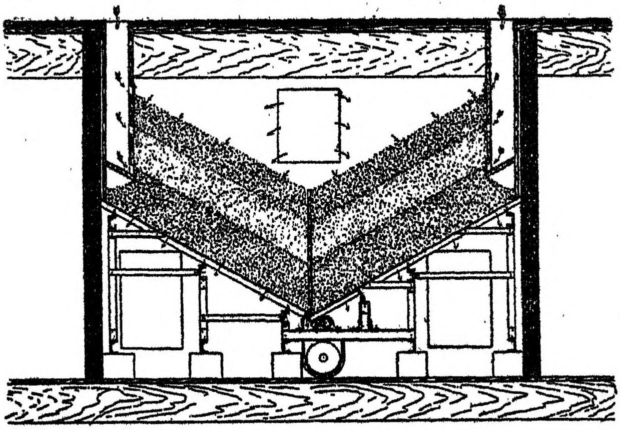

Fig. 2 — Vertical section.

The trial of the apparatus took place on May 20 and 21, 1913; the report contains a detailed account of the test; the results yielded on analysing the dried and undried barley are given in a table. The general verdict was:

1. The dryer is of simple construction, the cost of installation is not high and interruptions in its working are hardly to be feared.
2. The performance of the dryer is, considering its small size, fairly good.
3. The cost of drying is not high, notwithstanding that the ventilator shows an extremely high consumption of power.
4. The cost for removing one pound of water is in reality rather low.
5. The power of germinating has not been impaired, for the deviations observed before and after drying are within the limits of error.

1371 – **Alfalfa-curing Device for Rainy Countries.** — WING, JOSEPH E. in *The Breeder's Gazette*, Vol. 64, No. 13, p. 560. Chicago, September 24, 1913.

The annexed illustrations represent a device for drying alfalfa during rainy weather, which is at present used in Mississippi. It consists of simple home-made trucks of cheap construction resting on a pair of low iron wheels, thus differing advantageously from similar devices in its easy transportability. Fig. 1 shows the truck, which has a short leg in front that doubles under when it is moved forward. What would make about 500 pounds of cured hay is placed on each truck, and covered with a canvas cover under which the hay is as though it were under a little tent, not touching the ground. The loader trucks are left in the field until the hay is quite dry and ready for baling. These trucks are used also for other purposes: to gather cotton or corn or any other crop. The trucks can be attached to each other and a team of mules readily draws fifteen empty trucks. Fig. 2 shows the trucks in a cotton field; fig. 3 loading up in a field; fig. 4 a train of empties.

1372 – **Potato Drying Plant.** — VOSS, H. in *Zeitung für Spiritus und Stärke Industrie*, Year 14, No. 19, pp. 220-222. Munich. October 1, 1913.

After discussion of the conditions favourable to this industry, so useful to agriculture, with special considerations on the recent progress in cylinder drying apparatus, the writer gives some economic calculations on potato drying installations of different sizes and capacities, according to which the total working expenses for a one-drum "Tatösin" desiccator (1) (cost of installation and machines, interest and amortization, running expenses and working expenses proper) for installations working 120 days of 22 hours each per year, are as follows:

	£	s
Treating 3 000 metric tons of potatoes	869	10
» 5 000 » » »	1195	5
» 9 000 » » »	1791	18
» 12 500 » » »	2274	17

Consequently the cost of drying one English ton of potatoes is respectively: 5*s* $7^1/_4$*d*, 4*s* $10^1/_4$*d*, 4*s* $0^1/_2$*d*, 3*s* $8^1/_4$*d*.

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(1) See No. 1074, *B*, Sept. 1913. (*Ed.*).

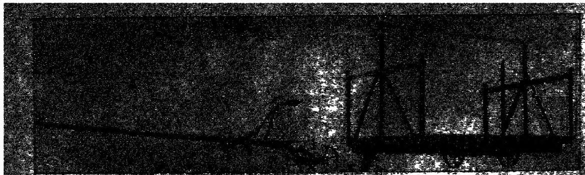


Fig. 1.

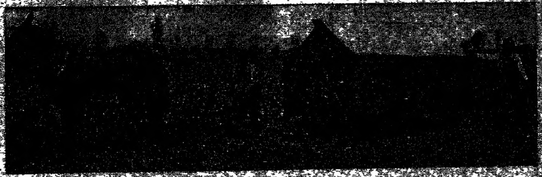
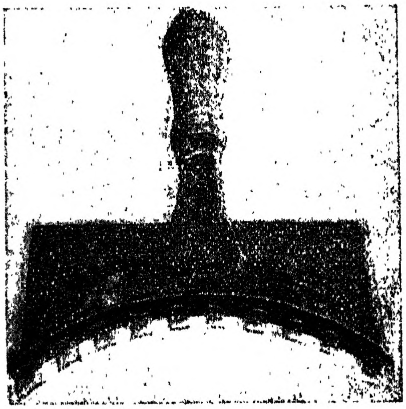


Fig. 2.

Fig. 3.

Fig. 4

1373 – **A New Instrument for Tapping Castilloa.** — *The India Rubber World,* Vol. XLIX, No. 1, p. 9. New York, October 1913.



The wounds caused by the tapping methods at present in vogue heal slowly and unsatisfactorily. Instead of removing a strip of bark, it is more advantageous only to raise it and allow the latex to flow. The part raised is replaced and the wound heals very quickly.

The secretaries of the Abispo plantation have invented an instrument (see fig.) which gives excellent results. It is possible to adjust the knife so that it penetrates the bark without damaging the cambium.

1374 – **Test of a "Westphalia" Milk Separator capable of working 330 Gallons per Hour.** — WIRTH in *Oesterreichische Molkerei-Zeitung,* Year XX, No. 20, pp. 317-319. Vienna, October 15, 1913.

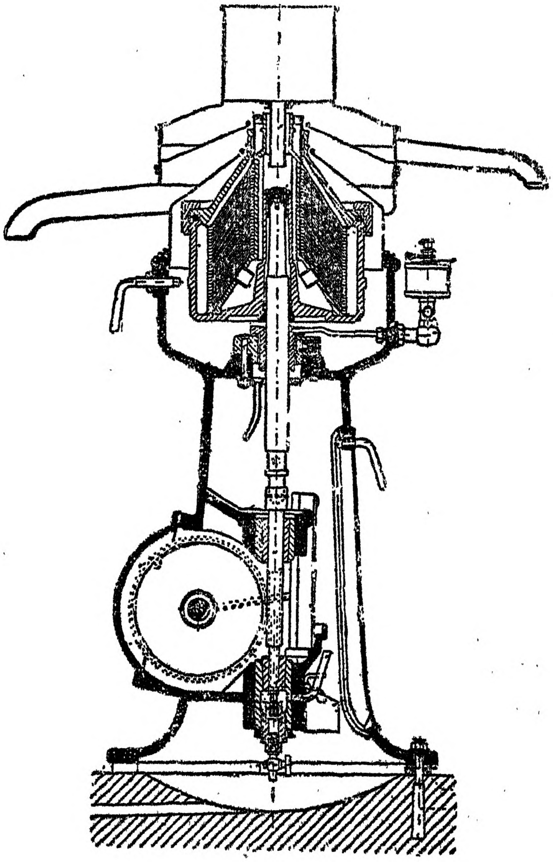
The writer begins by giving a description of the machine shown in section in the figure on the next page, and then reviews the experiments made with it and their results.

The machine was set up in the cooperative dairy at Gross Grünau, where during the eight months between December 1, 1912 and August 1, 1913, it treated daily from 660 to 770 gallons of milk.

On the test days samples of the whole milk, skimmed milk and cream were taken every 30 minutes and examined for fat content by Gerber's method. The examination for fat content of the skimmed milk was also carried out according to Gottlieb-Röse's analytical process. These determinations were made in the laboratory of the German Agricultural Academy at Tetschen-Liebwerd in Bohemia.

The most important data and figures are collected in tables. At a temperature of 95° F. (35° C.) with a cream containing 15 per cent. of fat and working at the rate of 330 gallons per hour, the skimmed milk contained only 0.05 per cent. of fat; at a higher temperature this was reduced to 0.01 per cent. The increase in fat-content of the skimmed milk on separating at a lower temperature or with a lower percentage of fat in the cream was only 0.004 to 0.01 per cent.

These tests show that the machine works very well, and that even under difficult conditions the separation is very perfect. As no hitch in the working occurred during the eight months, and as the machine is of simple construction and easy to clean, it may be recommended, and is likely to last well.



RURAL ECONOMICS.

RURAL ECONOMICS.

1375 – **Acreage under Crops and Grass in England and Wales in the Year 1913.** — *Board of Agriculture and Fisheries, Memorandum: Agricultural Returns of England and Wales*, 1913, 2 pp. London, October 20, 1913.

The total acreage under crops and grass in England and Wales in 1913 was 27 129 382 acres, that is 45 308 acres less than in the preceding year. The arable land, the extent of which was 11 058 233 acres, diminished by 277 043 acres, whilst the area of permanent grass and pastures increased by 231 735 acres and amounts now to 16 071 149 acres. The area under wheat was 161 776 acres less than in 1912; oats also occupied an area smaller by 97 779 acres. On the other hand the acreage devoted to barley has increased by 102 328 acres. Most other field crops show a diminished acreage, with the exception of lucerne and sugar beets which score slight increases. Potatoes occupy 20 868 acres less than in 1912 and mangolds 66 081 less, while the acreage of bare fallow rose from 273 725 to 387 832 acres. The extent of land under clover and grass in rotation diminished by 27 181 acres, but the acreage of these crops destined for conversion into hay increased by 145 572 acres.

1376 - **Technical and Economic Investigations on the Rearrangement of Properties in Bavaria.** — WEISS, A. in *Landwirtschaftliches Jahrbuch für Bayern*, Year 3, No. 9, pp. 381-484. Munich, 1913.

The writer has attempted, by means of an enquiry in the course of which he heard 125 farmers and people interested in agriculture who had taken part in the rearrangement of properties, to ascertain to what extent the rearrangement of properties made in conformity with the Bavarian law of May 29, 1886, on the subject, had answered to the technical requirements of agriculture, and what influence it had had upon farming in the rearranged districts.

In order to control the results obtained from the enquiry, he started further observations on the economical development of rearranged and not rearranged communes of the administrative district of Neu-Ulm, all of which are in about the same conditions as to their natural factors of production, which are those of normal Bavarian agriculture.

He begins by a short review of the history and of the expenses (average 30*s* per acre) of the rearrangement of properties in Bavaria, and proceeds to a discussion of the material collected from the enquiry and by his personal observation, giving the data in tables annexed to the paper, and arriving at the following conclusions:

In the whole territory investigated the average number of fields possessed by each person affected by the work was 9.9 before the rearrangement, and 4.6 after; the total number of fields is thus diminished by 53.5 per cent. The average extent of the fields was 0.84 acre before the rearrangement and 1.84 acre after it.

The fact that the extent of productive area of the majority of the farms ranges from 12 ½ to 50 acres diminishes somewhat the possible degree of rounding up. However, within the limits of the same kind of soil and of farming, and without prejudice to the greatest possible consideration for the economic position of the farmer in question, every effort must be made, on principle, towards complete rounding up. In general the question of the future economic possibilities gives the measure for the degree of rounding up to be attained.

A long period intervening between the notice of the operation and the delivery of the new fields is very disadvantageous for the individuals concerned and for the whole community, and is therefore to be avoided as much as possible. The rearrangement by stages and field by field is also to be condemned, since it often causes the chief advantages, such as the termination of the whole network of ditches and roads and complete rounding up, to be lost.

The want of rearrangement is not felt in all the territories comprised in the enquiry; nevertheless this idea has taken such deep root in some districts, especially in Swabia, that a solution of this problem should be generally facilitated by means of an alteration in the law.

To the question whether the agricultural and technical works should be carried out before or after the valuation of the territory to be rearranged, the answer is that the simultaneous drawing up of the plans for the network of drains and roads almost always renders a freer and more complete solution of the whole work of agricultural improvements possible, by adapting the road and drainage works to a systematic rearrangement of the land.

The writer then turns to the economic aspect of the question and treats first of the use of agricultural machines as influenced by the rearrangement. He shows that an increased, and especially a more profitable, use of machines (chiefly mowers and drills) is made in rearranged districts as compared with unarranged ones. In several localities, though, no increase of the number of machines has been observed, because the saving of time caused by the rounding up of the farms, especially in the medium-sized ones, has kept back the purchase of machines. It is questionable whether the rearrangement will have an influence on the formation of cooperative associations for the purchase of machines; while it is possible that the practice of employing contractors possessing machines to mow and to perform some other farm work may extend.

One very favourable effect of the rearrangement upon the tilling of the soil is due to the timely draining of the surface water, the better shape of the fields and the suitable construction of the roads. The manuring also, and the further care of the crops, were, according to the opinion of 96 per cent. of the persons interested, considerably assisted and especially the more outlying or formerly almost inaccessible localities were benefited by the roads, being as if brought nearer, and by the complete manuring thus rendered possible they had become more productive.

As for the influence of the rearrangement upon the utilization of the soil, it is certain that rearrangement in Bavaria has favoured the transition to a better system of farming, but it cannot be said that it has led everywhere to more productive farming, for the rearrangement of whole communes has not been general; further, the abolition of the old delimitations of the three fields in the improved three-year rotation has not been carried out everywhere.

In every 15 out of 100 communes a better rotation was introduced; the cases in which individual farmers adopted a better rotation after the rearrangement are much more numerous. Only a very far-reaching rounding up, without consideration of the three-field system, can — economic conditions permitting — render more general the adoption of better farming (with rotation of crops or without it).

The question whether fruit growing has really been stimulated by the rearrangements is answered in the affirmative by 44 per cent. of the observers. The plots allotted in the neighbourhood of the farmers' houses or of the villages were in 44 per cent. of the cases planted with fruit trees, while fruit growing in the open field has been only slightly extended (17 per cent. of the observations).

As for the effect of rearrangement upon gross production, it appears that the gross produce has risen on an average about 14 per cent. The special investigation on the harvests in the district of Neu-Ulm has shown that in the rearranged communes during the last 25 years the gross yields have had an average increase of 35 per cent., while those that were not rearranged had an increase of only 17.5 per cent. It must be noted that this result was obtained in the rearranged communes notwithstanding a more moderate use of artificials on an inferior soil.

The rearrangement was not able to cause any marked influence on the increase of. numbers of productive live stock, but contributed to render stock breeding steadier, owing to the surer supply of fodder in general and that from the arable land in particular.

As a further result of the rearrangement it is to be mentioned that the cost of production of crops became less, in consequence of the relative saving of 9 per cent. of human and animal labour and of 6 per cent. of the wear and tear of machines and implements. The increase of intensity in farming did not of course allow of any absolute saving of human and animal labour becoming noticeable.

The increase in the value of land due to the rearrangement amounts to 17.7 per cent., and the increase of rents to 29 per cent. A calculation made in the district of Neu-Ulm by comparing the rents paid in the rearranged and in the other communes, showed that the profits in the former amounted to 25 per cent. of the capital invested.

Lastly, the writer points out the social effects of rearrangement in its bearing upon the conditions of credit, on litigation about land or water questions, on the greater attachment to the land, on the reawakening of public spirit, etc.

1377 - **The Distribution of the Land, and Agricultural Progress.** — DE MONICAULT DE VILLARDEAU, PIERRE in *Annales de la Science Agronomique*, Year 30, No 3, pp. 265-282. Paris, September 1913.

Practical agriculture has not achieved anything like the success that the considerable progress in applied sciences would lead people to expect. The writer shows that not even the industrialization of agriculture, which cannot be completely carried out on account of the special conditions of agricultural labour and capital, can show this success. Only a new division of the soil better adapted to the needs of farming can render new and important progress possible. According to the special object of the farm, and to the soil and labour conditions, the extent of the farms should be increased or diminished. The writer then shows how this could be done (by renting and subrenting, by cooperative farming) and how by these means many difficult problems, as for instance, that of labour and of capital, could be more easily solved, and further how other difficulties therewith connected could be overcome without leading to a far-reaching change of existing conditions.

1378 - **Cost of Work in Farming.** — GIAGNONI, C. N. in *Agronomia*, Year 4, No. 19, pp. 273-286. Buenos Aires, August 1913.

This paper treats of the effect of the division of labour on the cost of labour, the cost of the day's work of men, draught animals and machines for certains agricultural operations, the cost of work performed by men, animals and machines together or the " complex day's work " (jornal compuesto), comparative cost of a given work performed by men, animals or machines.

1379 - **Farming on the Share System in the Bourbonnais, France.** — VILLATTE DES PRUGNES, R. Le contrat de métayage. — *La vie agricole et rurale*, Year 2, No. 43, pp. 428-430. Paris, September 27, 1913.

The conditions of the share system agreement which settles the rights and duties of landowners and their farmers in the old French province of Bourbon are the following :

The landowner gives the land, dwelling house and farm buildings, the capital for the purchase of certain articles required on the farm, a portion (from a third to one-half) of the live stock ; he gives the farmer, free of charge, all the straw and the hay from natural meadows and one-half of the hay from leys, he bears the whole expense of new buildings and land improvements, as well as of the upkeep of buildings, and one-half the monies spent on market dues, castration, weighing and shoeing of the live stock; he pays all the the taxes, the hire of the threshing machines and one-half of the necessary fuel. Further, he lets the farmer keep all the wood obtained from the trimming of hedges and the pruning of trees.

The farmer on his part gives all the labour required for working the farm ; he supplies the machines and implements, he performs all the compulsory work imposed on the farm by the commune and does the carting of materials required for repairs to the buildings on the farm. On entering the farm the farmer pays the landowner one-half the total value of the live stock existing on the farm after deduction of the share mentioned previously ; he pays, besides, a yearly sum called farm tax (impôt colonique) which amounts usually to 1*s* 3*d* to 2*s* per acre, and which varies according to the quality of the land, the state of the buildings and the share of the live stock borne by the landowner.

The produce of the farm is halved between landowner and farmer, with the following limitations: all the produce of a garden, which is always placed at the disposal of the farmer, belongs to him; as well as all the barley crop and all the potatoes minus 30 or 40 bushels. All the service fees, the tips usual in the country on the sale of live stock, the proceeds of poultry keeping (ducks, geese and turkeys excepted) as well as from the sale of milk and milk products belong to the farmer. When a farmer enters or leaves a farm, a valuer draws up an inventory; if at the end of the lease there is a surplus, as is almost always the case, the farmer gets one-half of it.

1380 – **Measures for Increasing the Economic Success of a Farm in the Department of Gard, France.** — VIGNER, R. Comment exploiter un domaine agricole dans le Gard? Consultation, in *La vie agricole et rurale*, Year 2, No. 42, pp. 416-423. Paris, September 20, 1913.

This is a description of the farm, 208 acres in extent, and of the previous system of farming. The measures to ensure success are: improvement of the soil and care of meadows and pastures, observance of a systematic rotation on the arable land, suited to the soil, climate and trend of farming, proper attention to the vineyard and to the oak plantation intended for the cultivation of truffles, introduction of the breeding and keeping of numerous head of productive cattle and sheep of the most suitable breeds.

1381 – **The Estate "La Rugginosa" in the Tuscan Maremma: Example of Intense Improvement.** — DAPPLES, CARLO in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 80, pp. 958-960. Berlin, October 4, 1913.

The writer describes the development of an estate of 1174 acres from 1906 to 1911 and indicates the methods adopted: improvement of the water conditions, systematic manuring, introduction of a regular rotation, division of the estate into farms. The maximum wheat crop in 1906 was 12 bushels per acre, while in 1910 it reached 31.8 bu. The average hay crop rose from 4.2 cwt. to 23.4 cwt. per acre. The total extent of pastures was 791 acres in 1906; in 1911 they were reduced to 52 acres, but there were 278 acres of grass leys. In the winter of 1906-07 the rent paid for grazing was 4*s* 4*d* per acre, while in 1910-11 it was 10*s* 10*d*. In 1906 the live stock on the estate were 25 oxen and cows, 6 calves and 17 horses; while in 1911 there were 69 oxen and cows, 32 calves, 4 horses and 35 pigs.

1382 – **Continuous Wheat.** — BERNARD, PAUL. Blés sur blés. — *Le Progrès agricole*, Year 27, Nos. 1367 and 1368, pp. 688 and 706-707. Amiens, September 28 and October 5, 1913.

The writer is of the opinion that the continuation of the favourable conditions of the wheat market and the increasing difficulties regarding agricultural labour are the two principal causes of the ever growing importance of the cultivation of wheat, and that at the same time they warrant investigation of the practical possibility of continuous wheat growing. He then gives three instances, from which it appears that under certain conditions the continuous cultivation of wheat or other cereals is not only practically possible, but also advisable from an economic point of view.

1. On the estate Arcy-en-Brie in France (Seine-et-Marne), cereals have for many years followed cereals, namely always wheat for two years in succession and then oats. The resulting crops during the ten years from 1890 to 1900 gave an average of 33.3 bushels (60 lbs.) of wheat per acre and 50.1 bushels (42 lbs.) of oats per acre. The average gross returns per acre were £8 16*s* per annum, so that after deducting £2 2*s* 3*d* for manures there remains £6 13*s* 9*d* for wages, rent and profit.

2. — The English experiment station at Rothamsted has, since 1843, grown wheat year after year on the same field in order to determine the influence of certain manures upon the yield. The crop on the plots which has received no manure since 1843 was 12.2 bushels per acre in 1908 (the

average of the 65 years being 13.0 bu.), while the farmyard manure plot yielded 39.7 bushels (the average for the 65 years being 35.7 bu.).

3. — On the Blount estate in England cereals have been continuously grown since 1865, with the following results: the average crop of the last 25 years was 35.6 bushels of wheat and 39.5 bu. of barley. Between 1900 and 1904 the gross returns per acre of wheat were £7 18*s*, which, after deducting £6 9*s* 6*d* for expenses, left £1 8*s* 6*d* for net profit.

1383 - **The Cultivation of Tea in Small Holdings.** — REINJUST, A. E. in *Mededeelingen van het proefstation voor thee*, No. XXIV, pp. 2-8. Buitenzorg, 1913.

The writer gives an account of the expenses of planting and managing small tea plantations of 25 and 50 bouws (44 and 88 acres) in area, similar to those being developed in India and Ceylon. The figures given are approximations and do not include interest on capital expended (See tables below. One florin = 1*s* 8*d* or $ 0.40).

A plantation of 50 bouws is large enough to run its own factory, with an outlay of about 30 000 florins, but for a plantation of half the size it would not be economical.

Plantation of 50 bouws.

	Years					
	1st	2nd	3rd	4th	5th	6th
Expenses:						
Clearing	12 500	—	—	—	—	—
Seed	5 000	—	—	—	—	—
Nursery	200	100	—	—	—	—
Upkeep of plantation	—	3 000	3 000	3 000	3 000	3 000
Manure	—	—	—	1 250	1 250	1 250
Manager's bungalow	500	3 000	—	—	—	—
Coolie lines	500	500	—	—	—	—
Buildings	1 000	—	—	—	—	—
Repairs to buildings	—	100	200	250	250	250
Roads and water	500	500	500	100	100	100
Administration	3 600	3 600	3 600	3 600	3 600	3 600
Labour	600	600	600	600	600	600
General Expenses	2 000	2 000	2 000	2 000	2 000	2 000
Overseer's salary	1 200	1 200	1 200	1 200	1 200	1 200
Sundry	400	400	900	—	—	—
Total	28 000	15 000	12 000	12 000	12 000	12 000
Receipts	0	0	1 250	6 250	15 000	25 000

Plantation of 25 *bouws.*

	Years					
	1st	2nd	3rd	4th	5th	6th
Expenses :						
Clearing	6 250	—	—	—	—	—
Seed	2 500	—	—	—	—	—
Nursery	100	50	—	—	—	—
Upkeep of plantation	—	1 500	1 500	1 500	1 500	1 500
Manure	—	—	—	625	625	625
Manager's bungalow	500	3 000	—	—	—	—
Coolie lines	200	300	—	—	—	—
Buildings	500	—	—	—	—	—
Repairs to buildings	—	100	150	175	175	175
Roads and water	500	500	500	100	100	100
Administration	3 000	3 000	3 000	3 000	3 000	3 000
Labour	300	300	300	300	300	300
General Expenses	1 200	1 200	1 200	1 200	1 200	1 200
Sundry	50	50	50	—	—	—
Total	15 100	10 000	6 700	6 900	6 900	6 900
Receipts	0	0	625	3 125	7 500	12 500

1384 – **Proportion of Area Occupied by the Various Crops and Net Profit.** – OSTERMAYER, A. Pflanzenbau und Reinertag. — *Zentralblatt für Landwirtschaft*, Year 93, No. 18, pp. 205-208. Brünn, September 16, 1913.

The solution of the problem of bringing the land to the highest degree of profitableness is in the first place dependent upon a suitable arrangement of the farm. The writer attempts to prove the truth of this statement by showing the reciprocal connection between the most important crops, the rotation followed and the manure used, and their effect on the profitableness of the farm, availing himself of the observations made on the books of 79 Moravian peasant farms, the average extent of which was 73.66 acres.

On grouping the farms according to the *area* of meadows and pastures, no law seems to be obeyed by the net profits in their oscillations. This is easily explained by the fact that the favourable action of the meadows on the crops of the arable land is due only to the transformation effected by the live stock of the fodder produced by the meadows into farmyard manure, and consequently it is not the *area* alone of the meadows that is intimately connected with the crops of the arable land, but also and to a great extent the *nature* of the meadows and the amount of their yield. If the farms be grouped according to this point of view it appears clearly that the existence of good meadows is capable of considerably increasing the crops:

Group	Hay crop per acre: lbs.	Net profit per acre	Wheat crop in lbs. per acre	Hoed crops in lbs. per acre
		£ s d		
I	3 529	2 11 9	1 633	16 565
II	2 375	2 5 3	1 470	16 479
III	1 706	1 19 6	1 403	14 131

The writer then divides the farms into three groups according to the proportion in which the land devoted to the production of fodder stands to the arable area, and at the same time according to the kind of fodder grown. Group I includes 26 farms which have developed their present rotation, mostly a six-year one, from the old three-year rotation, and consequently sow to clover at most one-sixth of the arable area. Group II comprises those farms which devote one sixth to one-quarter of their land to clover; these are eight farms following the Norfolk rotation and eight with a five-year rotation. Group III includes all those farms in which the rotation allows of more than a quarter of the area being devoted to forage crops. The greater extension of forage, which can only be obtained by leaving down the leys for two or three years, is found in 27 of the farms.

Group	Kind of fodder	Proportion of fodder in arable area	Net profit per acre
			£ s d
I.	Clover	up to 1/6	2 10 3
II	Clover	1/6 — 1/4	2 11 6
III	Clover and grass leys	more than 1/4	2 2 9

The farms which grow clover by itself prove more profitable than those which include grasses in the ley, and the profit in the former is greatest where the greater extent is given to the nitrogen-fixing clover.

With increasing intensity of cereal production, as is shown by the observations, there is an increase in the value of the soil, of the stock and of the total value of the farm, as well as in the income from the sale of the crops; the outlay on labour increases also, so that the extension of cereal cultivation is equivalent to a general intensifying of the farm, but not to the extent of affecting its profitableness. This is clearly shown by the following table, in which the work of the owner is valued at £3 2*s* 6*d* per month, and the rate of interest of the whole capital invested in the farm is placed opposite to the most important figures showing the ratio of the areas occupied by the various crops to each other.

Group	Net profit per acre	Interest on capital invested	Ratio of area of crops				Cereals	Forage	Cereals and forage in percentage of acreage	Area of meadows and leys percentage of acreage
			Cereals	Hoed crops	Forage	Various	In percentage of acreage devoted to cereals and forage			
			in percentage of acreage							
	£ s d									
I	2 9 11	2.0	67.2	14.1	15.2	3.5	81.5	18.5	82.4	24.6
II	3 2 9	4.1	61.4	16.2	20.3	2.1	75.1	24.9	81.7	32.0
III	2 2 6	2.5	57.4	14.9	21.7	6.0	72.5	27.5	79.1	32.4
IV	2 3 6	0.3	52.1	12.9	27.7	7.3	65.2	34.8	79.8	37.3
V	2 8 6	2.3	45.7	13.2	28.6	12.5	61.5	38.5	74.3	33.6

The extension of cereals thus takes place at the expense of the area occupied by forage plants, which is not without importance for the provision of nitrogen for the cereals. Of great interest is the second fact, namely that the rate of interest on the capital varies directly with the extent of the area devoted to hoed crops.

1385 – **Limits of Profitableness of Farm Expenses in the Peasant Farms of Moravia.** — OSTERMAYER, ADOLF in *Zentralblatt für Landwirtschaft*, Year 93, No. 20, pp. 229-233. Brünn, October 16, 1913.

The writer investigates to what extent intensifying the amount of capital and of labour influence the economic success of Moravian peasant farms. With this object in view, he divides the peasant farms into groups by a system of points according to the amount of capital and labour employed on them, and then observes the net returns and the rates of interest of the capital invested in the property.

In this way he investigates first the effect of the intensification of the amount of capital invested in live and dead stock (see Table A) and finds that with the increasing amount of this capital, not only do the net returns per acre increase, but also the rate of interest of the whole capital: thus from — 5.2 in Group I to + 3.9 per cent. in Group VI. Group VII, on the contrary, shows a falling off in both signs of profit, which signifies that under the conditions of production obtaining in these Moravian farms the maximum of profit is reached by the farms of the sixth group with an index of intensity of 11 to 12 points.

Similar results are obtained by examining the degree of intensity of the circulating capital (Table B). The limit is reached here by Group III, with a net income of £3 1*s* 8*d* per acre and an interest on capital of 3.6 per cent. The grouping of the farms according to the whole working capital, as is shown by Table C, reveals that the highest returns per acre and the highest rate of interest are reached by Groups II and III; beyond this a falling off in both takes place. It follows that the net returns increase with the increase of the working capital up to £3 1*s* to £3 5*s* 9*d* per acre and to an interest of 3 to 3.9 per cent. on the total capital; beyond this limit, and always allowing the farmer £3 2*s* 6*d* a month in return for his work, an investment of more capital in the farm is not advantageous, because the greater returns it causes do not bring in the rate of interest usual in the locality.

Table D shows the effect of increasing the amount of human and team labour. It shows first that the net returns increase with the intensity of labour. A closer examination proves that the work of the farmer and his family contributes an ever increasing share to the increasing net returns. The rate of interest, however, does not run parallel with the net returns, but reaches its maximum with a medium intensity of work at four points in Group II, beyond which it sinks considerably. From this the writer draws the conclusion that in rendering farming more intensive, capital must be considered as the dominant factor and that the greatest foresight is necessary in increasing the intensity of the labour factor.

From the figures of Table E, which contains a grouping of the farms, it is seen that the economic importance of these principles is not yet sufficiently recognized. The farms with increasing total intensity show increasing net returns up to Group VIII, but the figures showing the rate of interest do not follow a parallel course. The ascending tendency connected with greater intensity is so frequently and so deeply perturbed that it does not appear any more to follow a law; and in no case does the rate of interest reach the 3 to 3.9 per cent. which was observed in considering the degree of intensity of the capital or of the labour employed. For the increase of intensity to give good economic results "each of the outlays on labour and capital must be increased in the most suitable ration of effectiveness towards each other" (Aereboe).

The limit of the increase of intensity of a farm depends further to a great extent upon the economic and natural conditions of production prevailing at the time. The terms *intensive* and *extensive* must not be taken in the sense of an *absolutely* higher or lower outlay of capital and labour per acre of land, but in the sense of a relatively high outlay in relation to given economic and natural conditions.

This is proved by Table F, in which the influence of the natural and economic situation as well as the size of the farm upon the profitableness of intensifying is shown. The net returns here increase, in the most favourable natural situation (Group I), with the increase of intensity. This holds good for Group II also. In the less favourably situated Group III an increase of cultural intensity to the extent which is still advantageous in a better natural situation, is here no longer economically justifiable.

Group of farms	Degree of intensity: points	Total value of farm: crowns per hectare	Work done by farmer: man-months per ha.	Net returns: crowns per ha.	Value of farmer's work: crowns per ha.	Interest on capital	
						crowns per ha.	per cent.
A. — Intensification of capital in live and dead stock.							
I	up to 6	1 173	1.73	68	130	— 62	— 5.2
II	7	1 446	1.54	131	116	+ 15	+ 1.0
III	8	1 959	1.13	142	85	+ 57	+ 2.9
IV	9	1 977	1.20	147	90	+ 57	+ 2,8
V	10	2 448	1.55	186	116	+ 70	+ 2.8
VI	11–12	2 651	1.21	195	91	+ 104	+ 3.9
VII	13–16	3 907	1.63	165	122	+ 43	+ 1.1
B. — Intensification of circulating working capital.							
I	1	1 387	1.62	95	122	— 27	— 1.9
II	2	1 836	1.45	136	109	+ 27	+ 1.4
III	3	2 457	1.25	183	94	+ 89	+ 3.6
IV	4	3 311	0.99	160	74	+ 86	+ 2.5
C. — Intensification of the total working capital.							
I	over 14	3 507	1.16	109	87	+ 22	+ 0.6
II	13–14	2 565	1.54	181	118	+ 63	+ 2.4
III	11–12	2 094	1.17	152	88	+ 64	+ 3.0
IV	9–10	1 730	1.78	129	134	— 5	— 0.2
V	under 9	1 240	1.45	92	109	— 17	— 1.3
D. — Intensification of labour.							
I	up to 3	1 521	0.41	80	31	+ 49	+ 3.2
II	4	1 658	1.00	134	75	+ 59	+ 3.5
III	5	2 038	1.59	158	119	+ 39	+ 1.9
IV	6	2 382	1.76	144	131	+ 13	+ 0.5
V	7-8	3 224	2.40	207	180	+ 27	+ 0.8
E. — General intensity.							
I	up to 12	1 368	1.33	87	100	— 13	— 0.9
II	13	1 200	1.08	111	81	+ 30	+ 2.5
III	14	1 328	1.10	119	83	+ 36	+ 2.7
IV	15	2 128	1.15	126	86	+ 40	+ 1.9
V	16	2 101	1.31	147	98	+ 49	+ 2.3
VI	17	2 135	1.70	160	128	+ 32	+ 1.4
VII	18-19	2 387	1.70	167	128	+ 39	+ 1.6
VIII	20-22	3 051	1.86	218	140	+ 78	+ 2.5
XI	over 22	3 849	1.45	182	109	+ 73	+ 1.8

F. — *Influence of natural and economic position upon the admissible limit of intensiveness.*

Criterion of grouping	Group	Degree of intensity up to 14 points			Degree of intensity 15 to 17 points			Degree of intensity over 17 points		
		Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.	Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.	Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.
Natural position	I	—	—	—	2 471	0.85	185	3 188	1.27	203
	II	1 374	1.08	95	2 153	1.52	123	2 704	1.73	197
	III	1 179	1.40	117	1 645	1.40	190	1 872	2.90	152
Economic position	IV	1 432	2.10	124	1 891	1.26	65	—	—	—
	III	1 333	1.09	83	1 713	2.60	168	3 319	2.25	137
	II	1 257	1.18	93	2 296	1.03	161	2 897	1.57	205
	I	1 206	0.70	102	2 012	0.85	158	2 879	1.55	214
Size	I	1 294	0.36	79	1 942	0,05	99	—	—	—
	II	1 373	0.70	112	3 497	0.60	182	2 095	0.30	179
	III	1 270	0.88	99	2 346	1.15	123	3 327	0.60	140
	IV	1 435	1.83	137	2 109	1.21	186	2 937	1.24	229
	V	1 379	2.57	72	1 867	2.63	157	2 762	3.33	167

G. — *Intensification from the point of view of public economy.*

Degree	Capital in live and dead stock		Circulating capital		Labour		Total circulation	
	Points	Gain to public economy	Points	Gain to public economy	Points	Gain to public economy	Points	Gain to public economy
I	up to 6	102	1	129	up to 3	135	up to 12	126
II	7	180	2	212	4	206	13	165
III	8	221	3	276	5	219	14	181
IV	9	228	4	296	6	238	15	195
V	10	287	—	—	7-8	329	16	213
VI	11-12	290	—	—	—	—	17	263
VII	13-14	311	—	—	—	—	18-19	270
VIII	—	—	—	—	—	—	20-22	328
IX	—	—	—	—	—	—	over 22	343

The same is the case in the relations between degree of intensity and economic situation. Group III, consisting of farms already less favourably situated as regards economic position, shows that an increase of intensity is profitable only as far the second degree of intensity, and in Group IV extensive farming is the most profitable.

In investigating the effect of the size of the farm, it appears that the smaller the extent of the farm, the later are the limits of the advantages of intensifying reached. It thus follows that the greater intensity given to a farm is a means of increasing the net returns only within the limits set by its natural and economic situation.

From the point of view of the economic production of the country, the question has to be judged differently, inasmuch as there the increase of intensity is always connected with an increase of income, as is shown by Table G. Nevertheless, the interests of private and public economy go hand in hand, because more intensive farming is all the more capable of increasing net returns the better are the natural and economic conditions.

Thus when the whole country improves the economic conditions of agricultural production by facilitating and promoting agricultural improvements, etc., it makes a more intensive farming possible or facilitates it and thus renders itself the greatest service.

One crown = 10*d* or 20.3 c.; one hectare = 2.47 acre; 100 crowns per ha. = £1 13*s* 9*d* or $ 8.21 per acre.

1386 – **Cost of Milk Production in Mexico.** — BONANSER, SYLVIO in *Gaceta de Agricultura y Veterinaria*, Year 4, No. 7, pp. 1-3. Mexico, July 1, 1913.

The writer wishes to demonstrate that the sale of pure whole milk in Mexico at the price of 13.4*d* per gallon leaves no margin of profit, for the average cost of production of one gallon of milk is 13.1 *d*.

This cost is calculated as follows:

	£	*s*	*d*
Amortisation of the value of a cow, considering the average purchase price at £ 35 17 *s* 6 *d*, the average sale price at £ 5 2*s* 6*d* and the average period of milk yield at 5 years	6	3	0
Interest on the capital invested in the cow	2	3	0
Cost of feeding, 1*s* per day	18	9	0
Attendance, surveillance, taxes, implements, lighting, etc., 10*s* 3*d* per month	6	3	0
Veterinary surgeon and medicines, 2*s* per month	1	4	7
Rent of buildings, 2*s* per month	1	4	7
Total . . . £	35	7	2
Deduct the value of the calf		10	4
Cost of production of milk per cow per year . . . £	34	16	10

With a production of 2900 litres (638 gallons) of milk per year, the cost per gallon is 13.1 *d*.

AGRICULTURAL INDUSTRIES.

DAIRYING.

1387 - **The Actual State of the Dairy Industry in Japan.** — *Communicated by* DR. W. YAMASHITA, *Agriculturist to the Central Agricultural Experiment Station of the Empire.*

The diet of the Japanese people consists largely of vegetable food, the most important part of which is rice. When animal food is used it consists principally of fish. In ancient times, cattle were very commonly slaughtered both for food and as sacrifice. On the introduction of Buddhism in the middle of the sixth century, the custom of eating animal food gradually died out, as it was considered a crime to take life. Cow's milk as food was already known 1200 years ago, but it was rarely used and only by the higher classes. Cattle were generally reared only as beasts of burden and for tillage, until the restoration.

Since then the Government has laid great stress on the improvement of cattle by the importation of foreign breeds, in particular Ayrshires, Holsteins and Brown Swiss, and now cross-breds are steadily increasing throughout the country. The breeding of pure foreign cattle is also engaged in, and these too steadily increase in number. The following table gives the number of foreign pure-breds kept for breeding purposes (dairy-cattle) in 1909 :

	Cows	Bulls	Total
Ayrshires	1683	783	2466
Holsteins	1907	783	2690
Jerseys	100	37	137
Brown-Swiss	156	180	336
Simmenthalers	27	38	65
Guernseys	5	—	5
French Canadians	9	4	13
Total	3887	1825	5712

As the above shows, the Ayrshires and Holsteins predominate ; consequently the greater number of cross-breds in Japan have the blood of these two in them. The total number of cows at present kept in Japan is about 900 000. Of this number 50 000 are milch-cows fed exclusively for the dairy. The annual yield of milk from the dairies is about 10 000 000 gallons, corresponding approximately to 0.8 quart per head of population. In addition to this the farmers to some extent use milk from cows which are not kept really for milking purposes; still, the total is very small when compared with the quantities consumed in European countries.

However, the consumption of milk is increasing in Japan, and the deficiency of supply is made good by the importation of foreign dairy products. The following table shows the quantities of condensed milk imported and that produced at home since 1904.

	Condensed Milk imported	Condensed Milk produced in the country	Total
	lbs.	lbs.	lbs.
1904	6 021 684	288 041	6 309 725
1905	8 324 012	272 348	8 596 360
1906	7 469 292	293 349	7 762 641
1907	10 017 172	288 284	10 305 456
1908	10 909 920	320 096	11 230 016
1909	10 610 592	—	—
1910	10 792 586	834 387	11 626 973
1911	9 125 064	1 200 046	10 325 110

Condensed milk is imported into Japan from England, Germany, Switzerland, Austria-Hungary, Norway, the United States of America, Canada, etc.

Dairies in Japan are usually in the neighbourhood of cities or towns and seldom keep a large number of cows. Immediately after milking the milk is filled into small bottles. In these it is sterilized at above 80° C. in a small sterilizer heated by steam, and this milk is distributed to the consumers early every morning.

The condensed milk is prepared from milk supplied by farmers in factories owned by co-operative associations; in these the vacuum pan is made use of. The factories are as yet few in number; they are, however, expected to increase gradually.

The demand for butter is growing; the appended table gives the quantities imported and produced in Japan since 1906.

	Butter imported	Butter produced	Total
	lbs.	lbs.	lbs.
1906	157 113	55 236	212 349
1907	155 968	45 148	201 116
1908	129 597	—	—
1909	125 546	153 410	278 956
1910	129 874	230 639	360 513

Butter is imported from England, Germany, France, Belgium, Italy Austria-Hungary, Holland, Russia, Denmark, the United States of America, Canada, Australia, etc. In Japan it is commonly made on a small scale by milk dealers, but within the last few years small creameries have been organized by farmers on the co-operative system. Here butter is made and the skimmed milk is used for feeding calves.

Oleomargarine is also imported from foreign countries, but the quantity is decreasing; the method employed in making oleomargarine in Japan is very primitive.

The demand for cheese is still very small. Since 1903 the quantities imported and produced in this country have been as follows:

	Cheese imported — lbs.	Cheese produced — lbs.	Total — lbs.
1903	55 524	—	—
1904	56 764	—	—
1905	64 992	—	—
1906	55 081	—	—
1907	49 006	—	—
1908	45 262	—	—
1909	46 464	11 450	57 914
1910	44 884	15 181	60 065

Dairy farmers use common grass and rice straw for the feeding of dairy cows. This is due to difficulty of cultivating meadow grass profitably. Though sometimes corn-silage is used on the American system, the supply of coarse fodder has proved generally unsatisfactory. Of concentrated fodder, wheat-bran, rice-bran and *tofu* cake (*tofu* is vegetable casein made from soya-beans) are the most important. Lately, soya-bean cake, which is largely imported from Manchuria as manure for rice culture, is taking the place of wheat-bran as food for cattle.

Regarding the sanitation of dairies, two laws have been promulgated, the first to prevent the spreading of contagious diseases, the second to prevent the spread of tuberculosis in cattle. Cattle plague is kept in check in Japan by very rigorous measures. The inspection of tuberculous animals is made by the tuberculine-test and seriously diseases animals are slaughtered.

The sale of milk is regulated according to rules made by the Department of the Interior. The specific gravity, fat content, etc., are prescribed, and the sale of unwholesome milk from diseased animals is prohibited.

1388 - **Reindeer Milk and Reindeer Cheese.** — BARTHEL, CHR. and BERGMAMN, M. ARVID in *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel sowie der Gebrauchsgegenstände*, Vol. 26, Part 5, pp. 238-241. Berlin, September 1, 1913.

Milk. — Reindeer milk when freshly drawn is of a thick, creamy consistency and possesses a pleasant smell and taste. On keeping, the fat becomes rancid, the smell pungent and the taste unpleasantly sour. The Lapps always dilute it with a third or a half of its volume of water before drinking it. Undiluted it is used as cream for coffee. Butter is seldom prepared from it, but more frequently cheese, or a kind of dense milk in which leaves of *Rumex*, *Archangelica* and sometimes also *Mulgedium* are mixed. In order to keep it, the milk is left to freeze or to acidify spontaneously.

The percentage composition of the milk according to several analyses made by the writer is the following:

Water —	Protein (1) —	Fat —	Milk sugar —	Ash —
63.30	10.30	22.46	2.50	1.44

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(1) Nitrogen × 6.37.

In the ash the following percentage was found :

K_2O	Na_2O	CaO	MgO	P_2O_5	SO_3	Cl
14.64	16.20	35.28	2.72	30.44	1.68	4.17

The diameter of the fat globules averages 5 μ, but ranges between 1 and 14 μ.

The figures given by the writer agree with those found by Fleischmann and Pandnitz, except for fat content, which the latter found about 5 per cent. lower.

Cheese.— Reindeer's milk cheese is a fat hard cheese curdled with rennet, which in the Lapland Marches of Västerbötten is made in round shapes about 2 inches high and weighing about 1 pound ; the top and bottom of the cheeses are flat, the sides are rounded off. The rind is thin and the texture of the cheese is compact but fissured. Round the fissures the mass is yellow ; the rest is white, but it turns yellow immediately it is cut.

The rind has a pungent taste ; the cheese itself has the fine aroma of reindeer milk and melts in the mouth. It may, however, become rancid ; it has then a strong smell and an acrid taste. The cheese is mostly used by the Lapps as an adjunct to their coffee.

On analysis the cheese showed the following percentage composition :

Water	Protein and derivatives	Fat	Other organic matter	Ash
28.31	22.57	44.02	2.20	2.40

The total nitrogen is divided into : soluble N, 43.46 per cent. ; decomposition N, 12.24 per cent. ; ammoniacal N, 1.58 per cent.

For the fat constants the following figures were found :

Köttstorfer's saponification value	226.1
Reichert-Meissl number	34.6
Polenské's number	1.1
Iodine value (according to Hübl)	23.3
Refractometer reading at 40°	41.4

The saponification value and refractometer reading agree with the same constants for cows' milk, while the Reichert-Meissl number is higher and Polenske's and the iodine values are lower.

1389 - Lobeck's Biorisator Process (1). — FREUND, W. in *Molkerei-Zeitung*, Year 27, No. 77, pp. 1489-1491. Hildesheim, October 3, 1913.

The writer reports upon a trial of the milk sterilization process recommended by Lobeck carried out on behalf of the Association of the Large Milk Purveyors of German towns. In Germany hitherto two dairies have set up biorisators, one at Düsseldorf and the other at Leipzig. The Düsseldorf plant, which is erected on the dairy premises, can deal with 220 gallons per hour, while the biorisator placed in a shed adjoining the Leipzig dairy treats 55 gallons per hour. No tests were made as to the consumption of steam, but it appears to be low in both plants. The examination of the milk by the writer showed that in both dairies when the biorisator worked normally it did not cause any alteration in the milk as to appearance, colour, smell, taste or capacity of separating cream. The peroxydases also remain unchanged, though catalase and reductase suffer a slight reduction. Coagulation is somewhat delayed, but nowise impaired. The vegetative forms of bacteria, with the exception of individual specially resistant spores of earth and hay bacteria, are killed. All pathogenic germs are certainly destroyed by the biorisator. Biorised milk contains no albumen coagulum and possesses the same fat globules as raw milk. It is considerably superior to raw and pasteurized milk in its keeping qualities. The writer is convinced by the results of the test and by the impression received during the inspection of the installation that this process is really capable of accomplishing what is claimed for it.

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(1) See No. 743, *B.* June 1913 and No. 1190, *B.* Oct. 1913. (*Ed.*).

1390 – **Control of Butter Yield.** — Hesse, H. in *Molkerei-Zeitung*, Year 27, No. 68; pp. 1321-1322. Hildesheim, September 3, 1913.

The writer illustrates two formulae on the basis of which he has recently worked out nine tables for the calculation of the yield of butter from cream.

The formula for the calculation of the butter yielded by cream is the following:

$$\text{Yield of butter} = \frac{a\,(b-c)}{d-c}, \text{ in which:}$$

a = the quantity of cream churned
b = the fat content of the cream
c = » » » » » buttermilk
d = » » » » » butter

1391 – **The Scientific Basis of Cheese Maknig and the Use of Artificial Rennet in the Manufacture of Emmental Cheese.** — Allemann, O. in *Landwirtschaftliches Jahrbuch der Schweiz*, Year 27, Part 5, pp. 325-361. Berne, 1913.

The writer reports upon careful experiments conducted at the Dairy and Bacteriological Institute at Liebefeld, near Berne, with the object of throwing more light upon the scientific basis of cheese making and especially upon the question of the advisability of using artificial rennet in the making of Emmental cheese. The nature of artificial and of natural rennet was studied, as well as the value of both rennets, by means of comparative experiments in cheese making (with and without starters); the questions of milk coagulation, the working up of the curd before and after cutting, the processes which take place in the curd under the press, the treatment of cheeses during ripening and the valuation of results were also dealt with.

As to the rennet to be used in the manufacture of Emmental cheese, it was found that the natural rennet made by the cheese makers and the rennet powder called artifical rennet do not differ much in their action. With the exception of the fact that natural rennet is somewhat richer in lactic acid bacteria, it is nowise superior to the artificial product. In order to avoid the many injurious bacteria which are often present in naturel rennet, it is advisable to treat it with acids, or with pure cultures of lactic acid bacteria. On the whole, however, it would be better if the Emmental cheese makers were to give up natural rennet altogether in favour of the commercial rennet powder, duly combined with cultures of lactic acid bacteria. Experiments in this direction carried out at the Liebefeld Institute during several months have shown that cheeses made with artificial rennet and pure cultures of lactic acid bacteria are not inferior to those made with natural rennet and pure cultures of lactic acid bacteria.

1392 - **Synthetic Milk Production from Soya Beans in Liverpool.** — *The Chemical World*, Vol. II, No. 10, pp. 332-333. London, October 1913.

VARIOUS

A factory for the making of synthetic milk from soya beans and other ingredients is shortly to be established in Liverpool. Soya beans contain 40 per cent. of " soluble casein " under conditions which admit of its ready utilization for the making of milk, which, as regards nutriment, is claimed to be equal to cow's milk, having a fat more easily assimilable than that of the latter. The company projecting to establish a factory in Liverpool is the " Synthetic Milk Syndicate, Ltd., " London, and they will work according to Dr. Fritz Gössel's process (of Stockheim, Essen, Germany). For the production of 100 litres of milk the procedure is as follows: about 10 kilos of finely ground soya beans (or earth or pistachio nuts, or sesame or teal seeds or mixtures of same) are mixed with about 100 litres of water and a small quantity (about 5 gms.) of phosphate of soda or potash or the like, allowed to stand about an hour, and then slowly brought to the boiling point and only just allowed to boil; the liquid is then suitably filtered and the residue pressed after it has been cooled to about 50° C. About 2.4 kilos. of milk sugar or other suitable carbohydrates, about 6 gms. of sodium chloride and 60 gms. of carbonate of soda are dissolved in the liquor run off, and about 2 kilos. of sesame oil or any other suitable mixture of fats or oils are mixed with the solution. The milky liquor obtained would be brought to the volume of 100 litres by the addition of pure water. The " milk " can be manufactured at a cost which will admit of its being sold to dealers at 2 *d* per quart.

PLANT DISEASES

GENERAL INFORMATION.

GISLATIVE
D ADMINI-
STRATIVE
EASURES

1393 - **Importation of Vines into Roumania.** — Extract from *Moniteur commercial roumain*, Oct. 1, 1913, in *Feuille d'informations du Ministère de l'Agriculture*, Year 18, No. 41, p. 1. Paris, October 21, 1913.

The Minister of Agriculture and of the crown-lands of Roumania has issued the following decree to take effect in the autumn of 1913: All American grafts and vines of every kind entering Roumania must be accompanied by a certificate of origin, independent of the importation permit granted by the Ministry. This certificate must indicate : *a*) the place of origin, the commune, district and nursery in which they were grown; *b*) the name of the nurseryman sending the stocks, and the name of the receiver; *c*) the name and nature of the stocks; *d*) the frontier town from which they are sent into Roumania.

The certificate of origin must be legalised by the communal authority in the place of production as conforming to the declaration contained therein.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

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1394 - **On the Pathological Significance of the Endocellular Fibres in the Tissues of the Vine** (1). — PETRI, L. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Serie V, Vol. XXII, Second Half-year, Part 4, pp. 174-179 + fig. Rome, 1913.

The author asserts that the characteristic symptoms of "bramble-leaf" are always preceded for a year or more by the formation of endocellular fibres. In vines on their own roots which become slowly diseased there exists what may be called an incubation period during which the plants appear healthy externally, but possess endocellular fibres in the tissues of the stem. In the nurseries of Sicily it is easy to find stocks with normal growth, yet containing numerous endocellular fibres. They can be distinguished from really healthy vines only by the later development of the buds and the more vigorous growth of the suckers.The latent pathological condition can be determined by grafting healthy shoots of *Vitis vinifera* onto them, or better still by propagating cuttings. The disease appears in the course of the first or second year in the cuttings or in the grafts.

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(1) See No. 1207, *B.* Oct. 1913. (*Ed.*).

According to the writer, a vine with endocellular fibres in its young shoots does not necessarily become permanently attacked by the "bramble-leaf" disease. In previous works he has shown that healthy vines exposed to cold in spring may form endocellular fibres, with or without shortening of the internodes and perforation of the leaves, without being really diseased. In bearing vines, the damage is always confined to the one season, and if the new buds do not suffer from late colds in the following year, they develop normally. With vines grown for cuttings, however, the effect of late colds on the year's shoots is more serious, even if they show normal development. Cuttings obtained from such shoots, either in the nursery or planted out, show a low percentage of rooting. Those which do take root show the presence of endocellular fibres in the side roots; for this reason, grafts on these stocks also frequently develop the symptoms of " bramble-leaf ". Consequently the writer considers that vines showing the presence of these fibres are diseased, or at least show a latent pathological condition in the organs in which such cytological anomalies occur.

In order to remove any doubt as to the chance coincidence of the presence of these threads and " bramble-leaf " disease, the writer conducted experiments to determine what degree of disease could be attributed to the physiological disturbance of the active cambium cells, when, under the action of cold, they produce these fibres. In February 1913 he cut off at the base shoots of a vine which had been exposed to cold in the previous year and which showed the endocellular fibres, as well as control shoots; the two series of shoots were planted in pots and kept under the same conditions. The control shoots rooted and produced normal shoots, whilst the others did not develop roots and their buds soon withered. This does not prove that there is any genetic relation between the formation of fibres and " bramble-leaf ", but it shows that the shoots with the abnormal cell-contents are not healthy. Consequently in the reconstitution of vineyards, it is necessary to discard as far as possible those plants showing endocellular fibres in their wood.

The writer records that the repeated cold spells of the spring of 1913 caused a very serious outbreak of this abnormal cell condition even in the shoots at the base of the plants. It is not the position of the shoot which determines its resistance or otherwise to the effects of cold, but rather its particular stage of developemnt at the time.

The writer also confirms the fact that these fibres occur in the higher internodes only in vines that have been diseased for some time. The cambium in these internodes very rarely develops this abnormal condition, because such growth takes place when the period of spring colds is past; it is only when cold snaps occur very late that the cambium of the upper internodes can produce fibres. Such cases are naturally exceptional and are of no value in diagnosing the extent of the disease. It is different, however, with shoots of vines which have shown the formation of fibres for several years. In such shoots, fibres may develop in the internodes independently of the direct influence of cold. Consequently the development of fibres in the apical region of shoots has a pathological significance which is dependent on the presence of fibres in the woody tissues of the stem.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

1395 – **Experiments on the Susceptibility of the Oak to Mildew.** — RIVERA, VINCENZO in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 4, pp 168–173. Rome, 1913.

The writer has conducted experiments with seedlings of three varieties of *Quercus Robur* growing in culture media and in soil, in order to determine the influence of the age and turgidity of the leaf and the rate of root absorption and nutrition of the leaf on the susceptibility to mildew. Experiments have also been made on the infection of immune leaves.

As a result of these experiments it has been found that the full-grown leaves of the oak are resistant to the disease, while young leaves in an active state of growth are attacked, the degree of susceptibility being proportional to the rapidity of growth. This explains why the fresh shoots of pollarded trees, trunk shoots and suckers are so susceptible. Young growing leaves kept at even maximum turgescence in moist air do not get attacked, though conidia germinate on them very readily. Loss of turgidity due to high temperatures is an important factor determining infection. The concentration of the culture solution (Knop's solution) also influences the susceptibility of the leaf, because in pure water as well as in concentrated solutions, growth is arrested and immunity established.

Leaves completely etiolated are not susceptible, while those only partially etiolated are attacked in different degrees, those grown in a red light being less susceptible. Direct sunshine appears to hinder infection. Inorganic salts do not appear to exert any direct influence on susceptibility. In the experiments with resistant leaves, variations in turgidity were not successful in bringing about infection.

CTERIAL
FUNGOID
ASES OF
US CROPS

1396 – **Diseases and Pests of Cereals in 1912.** — RIEHM, E. in *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part 2, Vol. 39, No. 4-7, pp. 81-107. Jena, 1913.

A review of the most important work published during 1912, comprising the following:

1) Diseases and non-parasitic disturbances.
2) Weeds and fungi (*Ustilagineae*, *Uredineae*, *Fusarium*, straw blight, other fungoid parasites).
3) Animal pests (insects, birds and mammals).

A list of 134 publications quoted in the text is appended.

1397 - ***Rhabdospora alexandrina* n. sp., parasitic on Berseem *(Trifolium alexandrinum)* in Algeria.** — CHRESTIAN, J. and MAIRE, R. in *La Revue de Phytopathologie appliquée*, Vol. I, No. 9, pp. 125-129, figs. 1-6. Paris, October 5, 1913.

Trifolium alexandrium has been grown with success during the last three years at the School of Agriculture, Maison Carrée (Algiers). In December 1912, a disease, characterised by irregular black spots on the stems and round brownish spots scattered on the surface of the leaves, appeared and spread rapidly over an area of more than 2 acres. Fructifications of the fungus develop readily on the diseased patches on the stems, but rarely on the leaves. The writers consider this fungus to be a new species and describe it as *Rhabdospora alexandrina*, allied to *Septoria compta* Sacc. (which attacks the leaves of *Trifolium alpestre* and *T. incarnatum*) and differing from *R. Trifolii* Ellis. Pure cultures of the fungus have been obtained.

The damage of the infested plots due to this fungus amounts to more than half the crop. The rapid spread of the disease has apparently been favoured by the rather impermeable nature of the loamy soil and repeated mowing of the crop. Consequently the writers do not consider the disease liable to become an epidemic and endanger the cultivation of this clover.

As precautions against its spread, they recommend a suitable rotation and drainage of the soil. Spraying with copper sulphate after harvesting the crop has given decidedly beneficial results. The best means of limiting the damage would be to cut the crop early before it has been much injured.

1398 - ***Passalora Heveae* n. sp., a Leaf Disease of *Hevea brasiliensis* in British Guiana.** — BANCROFT, C. K. in *The Journal of the Board of Agricultural of British Guiana*, Vol. VII, No. 1, pp. 37-38. Demerara, July 1913.

The writer records a new leaf disease on Hevea observed recently amongst nursery trees. It is characterised by spots, increasing in size and forming dry areas, which ultimately become holes. The fungus causing the disease is said to be a new species, and is described as *Passalora Heveae* Massee.

It seems advisable to destroy all the affected leaves before planting out. Spraying with lime-sulphur is recommended for the nurseries, as it will also serve to destroy insects.

1399 - ***Oidium Agatidis* n. sp. and *Cercospora Agatidis* n. sp., Parasitic on *Agati grandiflora* (1), an Ornamental Leguminous Plant from Cochinchina.** — FOEX, E. in *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 3, pp. 348-352, figs. 1-3. Paris, 1913.

On leaves of *Agati grandiflora* from Cochinchina, the writer found irregular brown spots and minute black points. A water-colour drawing sent with the material shows that in the fresh state some of the leaflets show a white web-like covering suggesting the presence of a mildew. In sections, the writer has found an *Oidium* which he provisionally describes as *O. Agatidis*.

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(1) In the *Index Kewensis*, *Agati grandiflora* Desv. is referred to the genus *Sesbania*. (*Ed.*).

The black points are due to a new species of *Cercospora* which he calls *C. Agatidis*.

1400 – **Cucumber Leaf Spot (*Corynespora Mazei*) in Germany.** — ALTHEIMER in *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year 9, pp. 109-112. Stuttgart, 1913.

Cucumber leaf-spot (caused by *Corynespora Mazei*), though well known in England since 1896 and in Holland (where it is called "bladwour") since 1905, was first recorded in Germany at Hamburg in 1909, since when it has reappeared sporadically. The writer found it recently on some cucumber leaves received from Swabia and the Palatinate. It was probably introduced into Germany in seed bought from England and perhaps also in the cucumbers which are imported from England in large quantities each spring.

The disease first appears on the leaves as small spots about the size of a pin's head, conspicuously scattered over the entire leaf; these spots grow rapidly, forming dry patches and in about 7 or 10 days the entire plant may be destroyed. It is probable that a slight weakening of the plant predisposes it to infection; the rapidity of the destruction may then be accounted for by the susceptibility of cucumber plants to conditions of temperature, ventilation, soil and manure, and also by the rapidity of growth of the fungus.

Experiments on the disinfection of seed from the infected districts show that immersion for 24 hours in a 2 per cent. solution of copper sulphate does not interfere with their germination. The writer believes that a solution of corrosive sublimate may be useful.

The experiments (not yet completed) on the treatment of the disease by spraying various solutions, including copper-soda mixture, copper sulphate and other substances, afford no results of value.

The writer recommends a trial of basic slag and potash salts.

1401 – ***Asperisporium Caricae* and *Sphaerella Caricae* Parasitic on the Leaves of *Carica Papaya* in Brazil.** — MAUBLANC, ANDRÉ in *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 3, pp. 353-358, plate XXIX. Paris, 1913.

In the Rio de Janeiro district of Brazil, the leaves of the Papaw (*Carica Papaya*) are often attacked by a disease which appears on the upper surface as round or irregular spots 1 to 4 mm. in diameter, at first pale yellow surrounded by a broad brownish border and changing to a glistening white; on the underside of the leaf the patches quickly become covered with numerous brownish-black points, often arranged in concentric circles, and which ultimately cover the whole surface of the patch. Examination under the microscope shows that these black spots are the condial stage of a fungus known in other countries on the same host, and described successively as *Cercospora Caricae* Speg., *Scolecothricum Caricae* Ell. et Ev., *Epiclinium Cumminsii* Massee, *Pucciniopsis Caricae* Earle and *Fusicladium Caricae* (Speg.) Sacc; the writer considers it belongs to a new genus of Hyphomycetes, which he delimits under the name of *Asperisporium*, so that the fungus becomes *A. Caricac* (Speg.) Maubl.

The writer has also observed, on the upper surface of the older patches on the leaves, the formation of small black perithecia, which he considers to be the perfect form of *A. Caricae* and describes as new under the name of *Sphaerella Caricae*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1402 – ***Cuscuta arvensis* and its Hosts.** — D'IPPOLITO G. in *Le Stazioni sperimentali agrarie italiane*, Vol. XLVI, Part 7-8, pp. 540-549. Modena, 1913.

The writer sowed seeds of *Cuscuta arvensis* Beyrick with clover in a pot; after a time he observed that the parasite had spread out of the pot and had attacked various weeds growing along a road adjoining for a distance of more than 20 yards; these weeds were *Rumex pratensis*, *R. crispus*, *Mercurialis annua*, *Sonchus oleraceus*, *Sinapis arvensis*, *Solanum nigrum*, *Urtica dioica*, *Cnicus arvensis*, *Lactuca Scariola*, *Polygonum aviculare*, *Setaria verticillata* and *Matricaria inodora* (1).

Subsequently the writer placed fragments of *Cuscuta* on the lower part of the stems of two poisonous plants, *Conium maculatun* and *Delphinium Staphisagria*. He found, the day following the infection, that the parasite had already firmly attached itself to its host, which together with the parasite continued to develop normally. In the stems of *Conium* and *Delphinium* it was found that some of the cells containing the alkaloid had been broken into by the hanstoria of the *Cuscuta*.

1403 – ***Xanthium ambrosioides*, a New Composite Weed in New South Wales.** — MAIDEN, J. H. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 9, p. 774. Sydney, September 1913.

This weed, indigenous to Chile, has appeared near Jerilderie. It bears some resemblance to *X. spinosum* (2), but differs from it in its spreading habit, small deeply-divided leaves and grey colour. Every effort has been made to exterminate the weed, but it still threatens to become a serious nuisance. With a view to preventing its reappearance, it is important to determine the source of introduction.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1404 – ***Tetrastichus giffardii* n. sp., a Chalcid Parasitic on Species of *Ceratitis* and *Dacus* in West Africa.** — SILVESTRI, F. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 5, pp. 205-206. Rome, September 7, 1913.

The author gives a description of a new species of *Tetrastichus* which he found in Nigeria as a parasite of *Ceratitis stictica* Bezzi and *C. giffardii*

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(1) In this connection see No. 1298, *B.* Nov. 1913. (*Ed.*).

(2) See No. 2029, *B.* June 1911. (*Ed.*).

Bezzi; later he obtained it also from pupae of *Dacus cucumarius* Sack in the Kamerun, from pupae of *Ceratitis* on the Gold Coast, and again from *C. giffardii* in Dahomey.

This parasite passes its last larval stage and pupates in the pupæ of fruit flies of the genera *Ceratitis* and *Dacus*. He obtained as many as 15 to 34 individual parasites from a single infested pupa.

The parasite deposits its eggs in the eggs of its host, or in the young larvae just hatched, but not in the full-grown larvae and pupae. It is not yet known whether the female lays a single egg which becomes a polyembryo, giving rise to numerous individual parasites in the pupa, or whether it lays several eggs in one host insect.

INSECTS NJURIOUS O VARIOUS CROPS

1405 - **Injurious Insects in German East Africa.** — MORSTATT, H. in *Der Pflanzer*, Year IX, No 6, pp. 288-296. Daressalam, 1913.

The writer gives a list of 170 injurious insects so far recorded in the colony. After the scientific name of each insect, is given the plant or vegetable product it attacks, also references to publications relating to the insects. The common names of some species or families are given.

1406 - ***Hypsopygia costalis*, Injurious to Lucerne Hay in the Romagna, Italy.** — SBROZZI, DINO in *L'Italia Agricola*, Year IV, No. 18, pp. 444-451, 1 plate. Piacenza, 1913.

Hypsopygia costalis Fab. has been recognised since 1902 as being injurious to sulla hay in Central Italy; it has now begun to attack lucerne hay in the Romagna, where it is known as " tarlo " or " tignola ". The larvae destroy the leaves almost completely, leaving only the stems with a few petioles. Attached to these are numbers of silky threads with cocoons containing pupae, and the excreta and cast-off skins of the larvae. The fodder is thus badly damaged.

In an average attack, or when the hay does not consist entirely of lucerne, the loss is at least 20 per cent., but it may reach 50 or 60 per cent.

The writer explains the life-history of the insect, and mentions that poultry eat the larvae greedily ; they may thus be used to destroy them when the hay is shaken out before being fed to stock. Many of the larvae, carried into the stables with the hay during winter, are destroyed by spiders. It is also not uncommon to find larvae and pupae attacked by microscopic parasites not yet identified, and also by Braconids. Carbon bisulphide has not been found effective for disinfecting hay-stacks. The writer recommends that when a stack is attacked it should be used up as soon as possible to prevent the development of the larvae. Hay to be chaffed should first be carefully shaken out so that the larvae falling can be picked up by the poultry. The fodder can be made more acceptable to cattle by moistening with salt water, provided it is not too mouldy. Some larvae, however, will escape and hibernate in the stable. These should be destroyed by carefully cleaning the walls and ceiling, particularly the crevices, towards the end of April, the cocoons swept out being burnt. The stable should then be sprayed with a solution of formaline and white-washed.

The spread of this insect is accounted for by its well known habit of being able to live on any dried refuse. The presence of adults in hawthorn hedges in May suggests that it feeds on the dry leaves of this plant. Thus it can easily attack neighbouring crops of sulla and, owing to its rapid propagation and the favourable hibernating conditions offered by the stacks, it has become a specialised pest of this plant. Once the insect has become adapted to these conditions, it is easy for it to adapt itself to other Leguminosae, such as lucerne.

1407 – **Insects Injurious to Sugar-Cane in British Guiana and their Natural Enemies** (1). — BODKIN, G. E. in *The Journal of the Board of Agriculture of British Guiana*, Vol. VII, No. 1, pp. 29-32. Demerara, July 1913.

The writer gives a list of 32 species of injurious insects, most of them well known from other regions, with common names and natural enemies of some.

1408 – **Phricodus hystrix, a Bug attacking Sesame.** — DISTANT, W. L. in *Bulletin of Entomological Research*, Vol. IV, Part 2, p. 143. London, September 1913.

Phricodus hystrix Germar (= *Aradus hystrix* Germ., *Phricodus hystrix* Spin., *Stenotoma desjardinsii* Westw., *Phricodus fasciatus* Sign.) has been found in South and Central Africa, Madagascar and Mauritius. It is now recorded at Coimbatore (Southern India), on sesame (*Sesamum indicum* L.) and is probably a recent introduction there.

1409 — ***Solanophila paenulata*** **("Vaquita de los melones"), Injurious to Cucurbitaceae in the Province of Mendoza (Argentine).** — REED, CARLOS S, in *Agronomia*, Year IV, Vol. II, No. 17-18, pp. 194-197. Buenos Aires, 1913.

This insect, which is found abundantly on melons, lives also on other Cucurbitaceae (pumpkin, watermelon, cucumber, etc.) The larvae are very voracious and cause the appearance in spring of circular spots, 2 cm. in diameter, on the leaves; later the tissues are devoured completely, so that the spots become holes.

The writer describes the life-history of the insect, which appears to have no natural enemies. He observes that it is particularly susceptible to the action of insecticides, and further that it remains exposed on the plants throughout its life-history, being particularly active during the day. It is therefore easy to control.

It frequently happens that these plants are attacked at the same time by aphis and *Solanophila*. The writer recommends spraying in December with an emulsion of ordinary soap and kerosene oil. The 3 per cent. extract of tobacco did not give good results. A mixture of aceto-arsenite of copper (1 gram per litre of water) and 1 gram of lime was found most effective. The spraying should be repeated every 10 or 15 days until the insect disappears. A practical method of control which does not cost much is collecting the larvae in the morning when they are torpid, either by shaking the plants over canvas stretched underneath or by hand-picking.

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(1) See also Nos. 438-440, *B*. Feb. 1912. (*Ed.*)

1410 - ***Eleodes omissa* var. *borealis*, Injurious to Fruit-Trees and Watermelons in California.** — ESSIG, E. O. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p. 627, fig. 356. Sacramento, California, August 1913.

During May and June 1913 *Eleodes omissa borealis* (Tenebrionidae) was reported in various districts in California, as causing considerable damage to oranges and watermelons. In one orchard a large number of apricots and plums were completely destroyed by these insects. They appeared in such numbers as almost completely to cover the ground below the infested trees. Poisoned bran was found of little use, since the insect prefers to feed on the plants. Spraying with poisonous solutions gave no better results. It is very probable that the appearance in such large numbers of this insect was due to the abnormally dry season.

1411 - **The Prune Aphis (*Aphis prunifoliae* Fitch) in California.** — ESSIG, E. O. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p. 624, fig. 355. Sacramento, California, August 1913.

The appearance of this aphid was recorded in June 1913. Since then the aphid has been recorded from many sections of the Sacramento valley and has caused alarm to some of the prune growers. The louse is light green in colour and is covered with a rather thick coating of fine white powder, which at once distinguishes it from all other lice attacking the prune. It attacks the tips of the twigs and collects in exceedingly large colonies, especially upon the under sides of leaves, which are slightly curled by their work.

In May 1913, the larvae of Syrphid flies and internal Hymenopterous parasites were in sufficient numbers to indicate that the pest would be subdued before it did any great amount of damage. In a few sections, however, control measures were found necessary; these consisted in the application of a spray composed of nicotine sulphate in the proportion of 1 to 1500. A coarse driven spray under high pressure is necessary to force the liquid through the powdery waxy coating secreted by the insect.

1412 - ***Mytilaspis coccomytibus dispar* n. sp. and *Diaspis taxicola* n. sp., Scale Insects observed in Madagascar and Algeria respectively.** — VAYSSIÈRE, P. in *La Revue de Phytopathologie appliquée*, Vol. I, No. 9, p. 124. Paris, October 5, 1913.

Description of two new species. The first was found in large quantities on a branch of *Manihot* from Madagascar, and the second occurred on yew (*Taxus baccata*) in the Atlas of Blida, Algeria.

ALFREDO RUGGERI, *gerente responsabile*.

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